

**Ambient Air Quality Monitoring  
Opportunity and Warm Springs Sites  
First Quarter of 2008**

Prepared for

Anaconda Deer Lodge County

September 2008

**Kuipers & Associates**  
PO Box 641  
Butte, MT 59703  
(406) 782-3441

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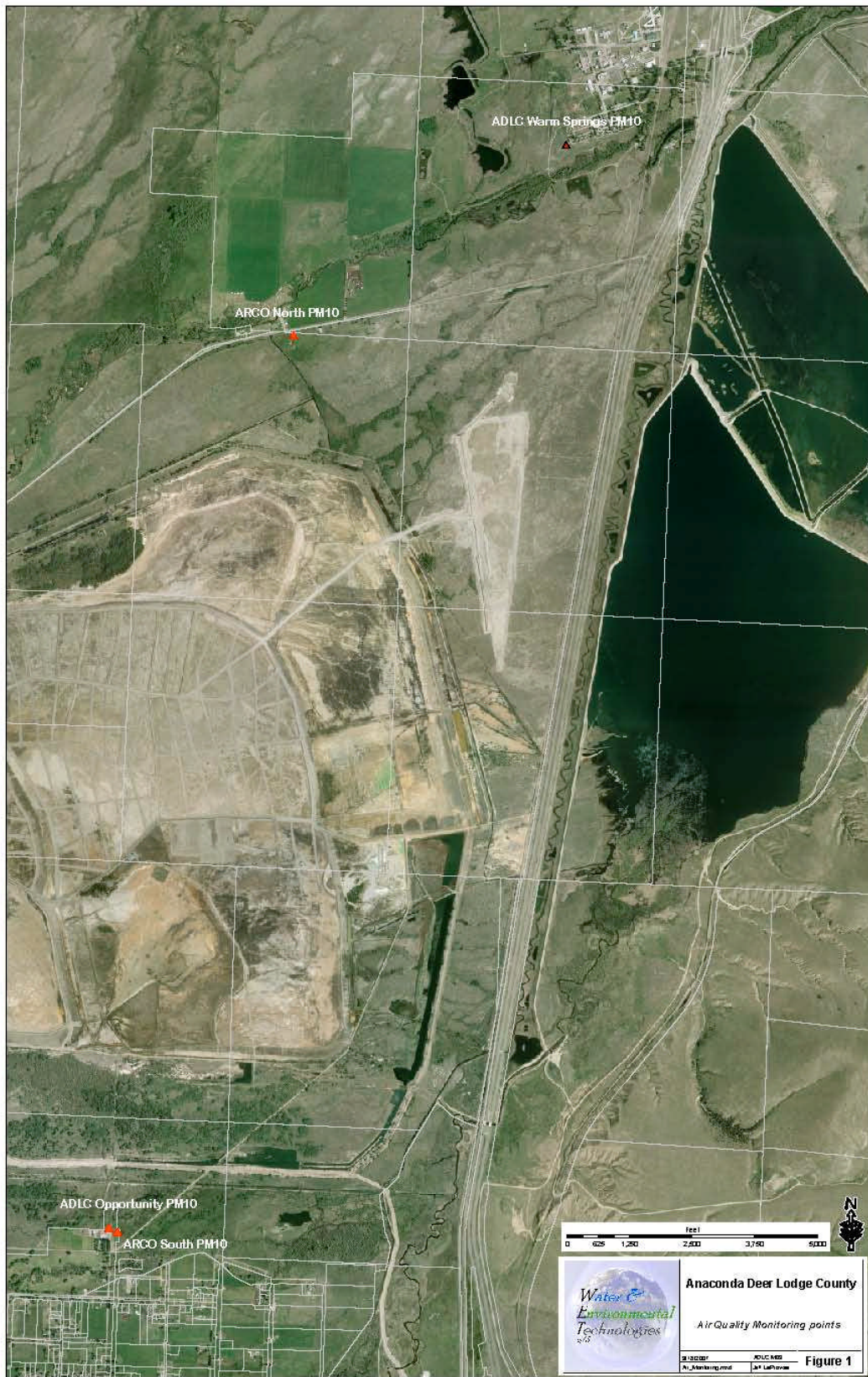
## 1.0 INTRODUCTION

This quarterly report documents the ambient air quality monitoring program conducted by Kuipers & Associates on behalf of Anaconda Deer Lodge County at Opportunity and Warm Springs locations adjacent to the Atlantic Richfield Lower Waste Management Area. The months of January through March, 2008, are included in this quarterly report, with a more detailed data summary in the monthly reports.

Objectives of this quarterly report are listed below.

- Summarize the PM10 data on a quarterly basis and compare to applicable standards.
- Compare daily average PM10 values recorded by both the Opportunity Site and the Atlantic Richfield Company's South Site.
- Present summarized meteorological data for the quarter.
- Present the Data Quality Summary (PM10 and meteorological).
  - Review the hourly data according to the Environmental Protection Agency's Air Quality System Null Data Qualifier Codes.
  - Format hourly PM10 data for each month to fit the Environmental Protection Agency's Air Quality System raw data template.

Figure 1 shows the ADLC monitoring locations in Opportunity and Warm Springs, and the Atlantic Richfield Company's South Site monitoring location.



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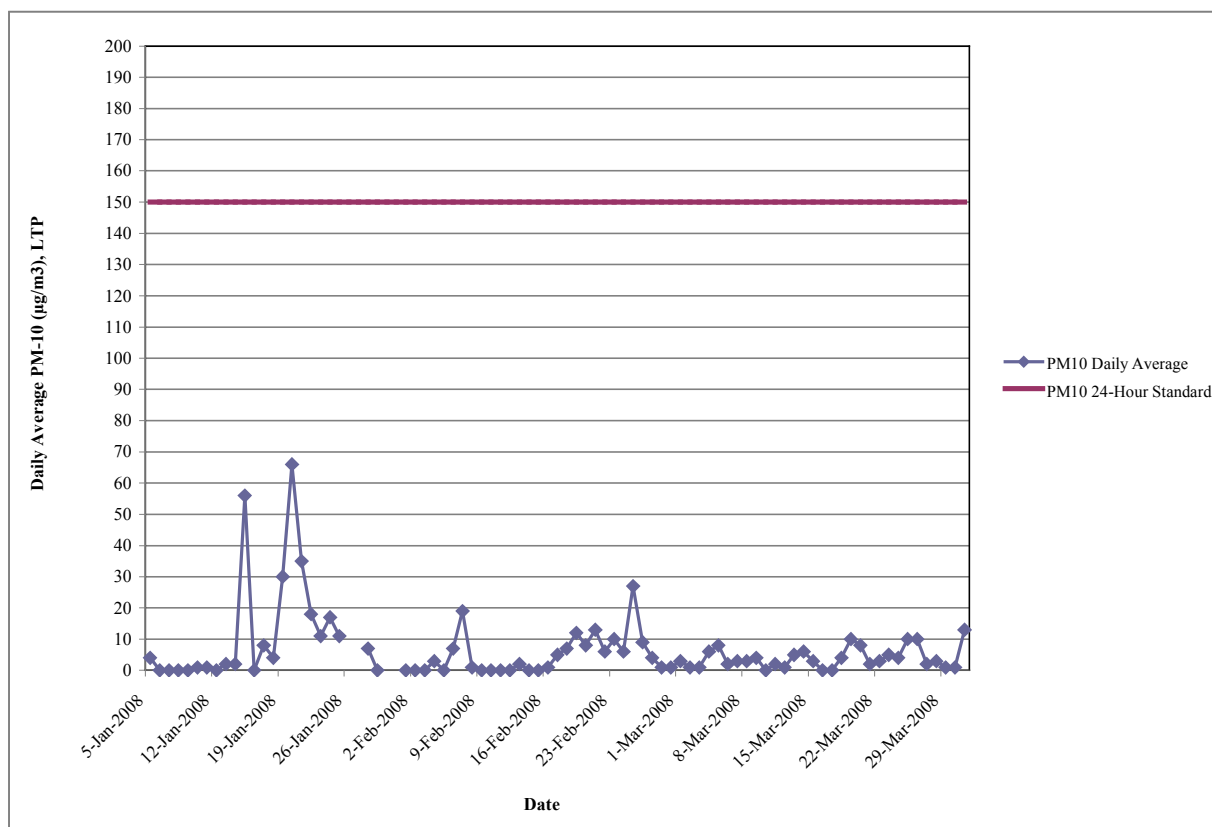
## 2.0 PM10 DATA SUMMARY

The Met One E-BAM PM10 portable monitors collected continuous hourly data at both locations beginning January 5, 2008, immediately following recertification of the monitors by the manufacturer. The samplers were taken off-line on December 5, 2007.

During the period of operation, data recovery was 91.3% at Opportunity and 98.6% at Warm Springs. Detailed ambient air quality monitoring results for the first quarter of 2008 are summarized in the January, February and March monthly reports prepared by Kuipers & Associates. A general discussion of ambient air quality monitoring data from the first quarter of 2008 is provided in the following sections. All PM10 data are reported at Local temperature and pressure (LTP) conditions.

### 2.1 Opportunity Site

At the Opportunity location daily average PM10 concentrations ranged from non-detectable to  $66 \mu\text{g}/\text{m}^3$  with an average of  $6 \mu\text{g}/\text{m}^3$  throughout the first quarter. The maximum daily average PM10 reading of  $66 \mu\text{g}/\text{m}^3$  was observed on January 20, when fairly strong ( $\sim 6 \text{ m/s}$  / 13 mph) northerly winds occurred for much of the day. There is considerable hourly variability on many days; on average the maximum daily one-hour concentration was  $84 \mu\text{g}/\text{m}^3$  in January,  $23 \mu\text{g}/\text{m}^3$  in February and  $23 \mu\text{g}/\text{m}^3$  in March. Daily PM10 average concentrations for the quarter are presented in Figure 2 for the Opportunity monitoring site.



**FIGURE 2 – OPPORTUNITY SITE DAILY AVERAGE PM10 CONCENTRATION**

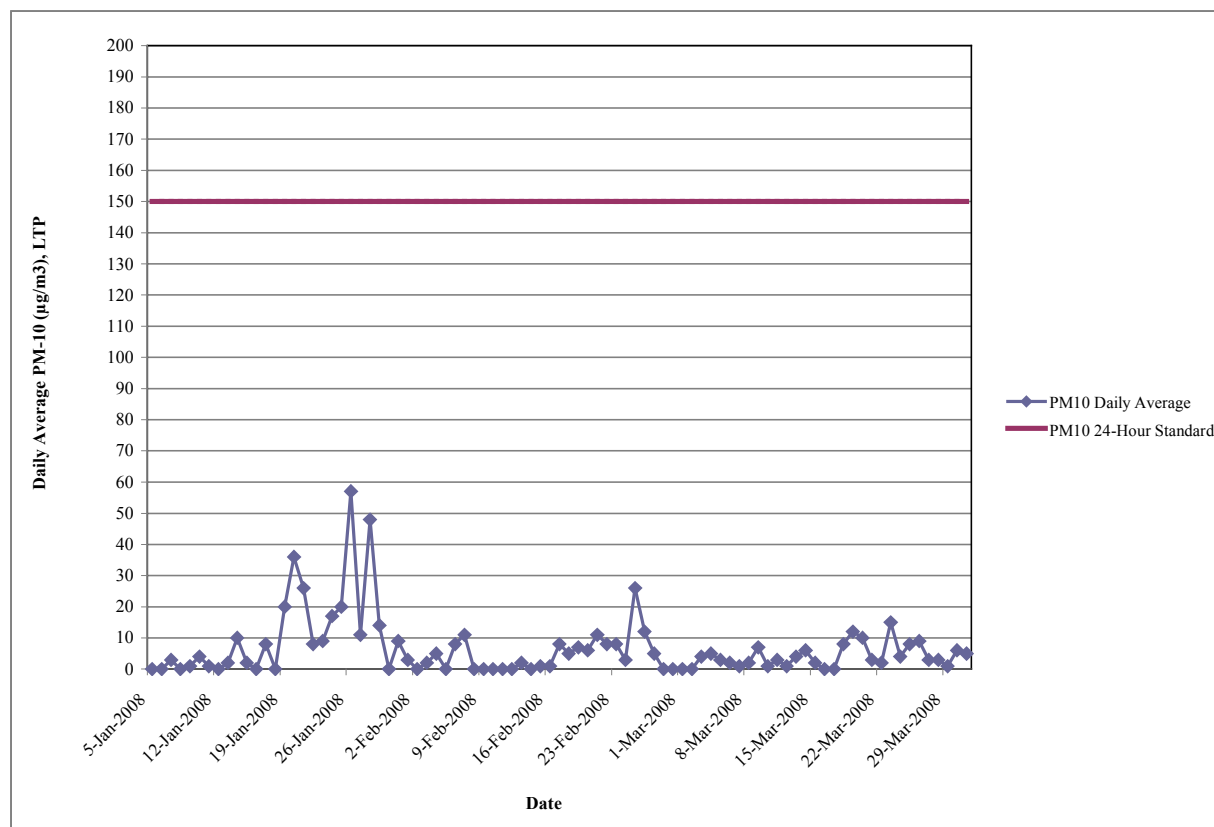
Ambient Air Quality Monitoring  
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All daily average PM10 results for the first quarter of 2008 at Opportunity were below the 24-hour Montana Ambient Air Quality Standard of  $150 \mu\text{g}/\text{m}^3$ .

No Opportunity PM10 data from the first quarter was rejected or omitted for quality assurance / quality control check results. However, some data was lost due to operational problems. In late January and early February, 123 hours of PM10 data were lost because of failure of the E-BAM's internal pressure sensor. Another 10 hours of data were lost on January 21 because the E-BAM sampler stops operating when the ambient temperature falls below minus  $30.0^\circ\text{C}$ . Additionally, one high PM10 hourly reading was excluded from analysis because it was strongly suspected to be invalid. These data periods are discussed in detail in Section 5.

## 2.2 Warm Springs Site

At the Warm Springs location daily average PM10 concentrations ranged from non-detectable to  $57 \mu\text{g}/\text{m}^3$  with a quarterly average of  $6 \mu\text{g}/\text{m}^3$ . The maximum daily average PM10 reading of  $57 \mu\text{g}/\text{m}^3$  was observed on January 26, when fairly strong ( $\sim 6 \text{ m/s}$  / 13 mph) south-southwesterly winds occurred for much of the day. There is considerable hourly variability on many days; on average the maximum daily one-hour concentration was  $65 \mu\text{g}/\text{m}^3$  in January,  $27 \mu\text{g}/\text{m}^3$  in February and  $30 \mu\text{g}/\text{m}^3$  in March. Daily PM10 average concentrations for the quarter are presented in Figure 3 for the Warm Springs monitoring site.



**FIGURE 3 - WARM SPRINGS SITE DAILY AVERAGE PM10 CONCENTRATION**

All daily average PM10 results for the first quarter of 2008 at Warm Springs were well below the 24-hour Montana Ambient Air Quality Standard of  $150 \mu\text{g}/\text{m}^3$ .

No Warm Springs PM10 data from the first quarter was rejected or omitted for quality assurance or quality control reasons.

### **3.0 COLLOCATED PM10 RESULTS COMPARISON**

Daily average (24-hour) results from the ADLC E-BAM PM10 monitor at the Opportunity site were compared to the Atlantic Richfield Wedding PM10 monitors at the South Site for the quarter. The ADLC monitor collects screening level data, while the Atlantic Richfield monitors follow a federal reference method (FRM) required for compliance with air quality standards.

Collocated PM10 precision criteria allow for a difference between samplers of  $5 \mu\text{g}/\text{m}^3$  at concentrations below  $80 \mu\text{g}/\text{m}^3$ , and  $\pm 7\%$  for higher concentrations (EPA 1998). The data satisfied these criteria for 20 of the 27 collocated sampling dates. On the remaining seven collocated dates, the concentrations for the ADLC sampler were considerably higher than for the Atlantic Richfield sampler. The most striking difference occurred on January 19, when the ADLC sampler reported an average of  $30 \mu\text{g}/\text{m}^3$ , versus  $3 \mu\text{g}/\text{m}^3$  for the Atlantic Richfield sampler.

An examination of the ADLC sampler's hourly data for January 19 showed values ranging between non-detect and  $8 \mu\text{g}/\text{m}^3$  until the last two hours, when values of  $257 \mu\text{g}/\text{m}^3$  and  $382 \mu\text{g}/\text{m}^3$  were reported. Elevated particulate concentrations continued for approximately 16 hours on the following day. During this period, it is suspected that the E-BAM sampler's operation may have been affected by unusual meteorological conditions, as discussed in the following paragraphs.

This abrupt increase in concentrations was associated with rapidly changing weather conditions; winds for January 19 were generally southerly to southwesterly at 1-3 m/s until the last two hours, when they suddenly became northerly at over 6 m/s and continued for much of the following day. This coincided with the arrival of a strong arctic cold front. The sampling tape was examined, and while the dots for the elevated period showed some brownish-tan color (indicating airborne particulate), they also had a non-uniform, fuzzy appearance, as though moisture might have reached the sampling tape. The relative humidity readings for the period were around 80%, indicating that it may have been snowing. This is supported by reports of snowfall at the Butte airport on both January 19 and January 20.

Rapidly falling temperatures accompanied this weather event; during the first two hours, a decrease of over 9 degrees Celsius occurred. The E-BAM samplers employ an internal heater to prevent moisture condensation on the filter tape, by keeping the humidity of the filter tape at or below 45%. Under the severe weather conditions described above, this may have been insufficient to evaporate moisture in the sample stream before it reached the sample tape, since the filter temperature was well below freezing and frozen precipitation may have been present.



It is possible that small particles of frozen precipitation were drawn into the sample stream (enhanced by the strong northerly winds), and then impacted the filter tape. This phenomenon could have enhanced the sampler's beta attenuation process, and contributed to higher *calculated* particulate concentrations.

While meteorological conditions may have contributed to the large discrepancy in daily average particulate concentrations between the ADLC and Atlantic Richfield samplers on January 19, it must be emphasized that the brownish-tan sampling tape dots for the last two hours do support the presence of some airborne particulate. The PM10 data for this period were not invalidated, but have been flagged due to the unusual appearance of the dots and the rapidly changing weather conditions. It should be noted that elevated concentrations also were noted at the ADLC-Warm Springs site during that period, and that the sampling tape dots had a similar appearance.

Otherwise, the largest observed difference between the Atlantic Richfield and ADLC samplers was  $11 \mu\text{g}/\text{m}^3$  on January 25. While this difference exceeds the collocated precision criteria, it is not inconsistent with differences occasionally observed during previous quarters. For the entire data set, the average difference between the monitors was  $4 \mu\text{g}/\text{m}^3$  with a range of plus (+) 27 to minus (-)  $2 \mu\text{g}/\text{m}^3$ . The average absolute difference was also  $4 \mu\text{g}/\text{m}^3$ . If the extreme event of January 19 is excluded, the average difference decreases to  $3 \mu\text{g}/\text{m}^3$ . Individual collocated results are listed in Table 1, and depicted graphically in Figure 4. They indicate somewhat poorer agreement of PM10 values between the ADLC and Atlantic Richfield monitors compared to previous quarters. The collocated results failed to meet EPA collocated data criteria on seven of the 27 sampling dates, possibly due to the difference in sampling methods, and the distance between the samplers. Additionally, meteorological conditions may have contributed to the large discrepancy observed on January 19.



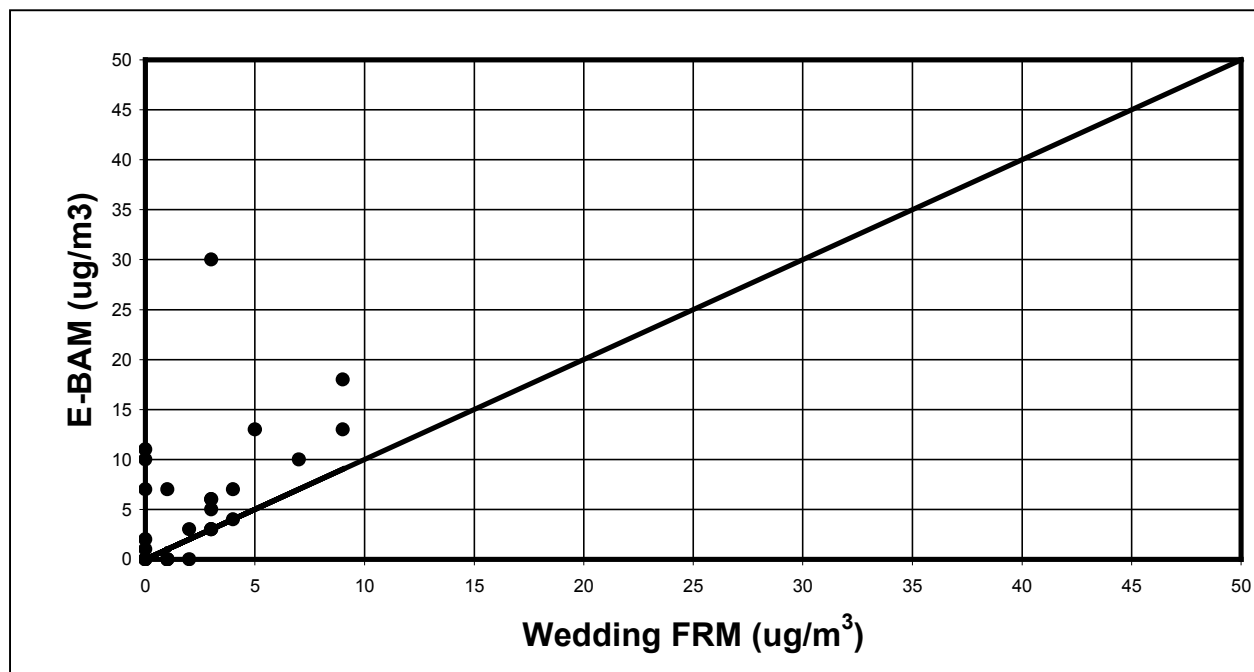
**TABLE 1 – COLLOCATED RESULTS FOR PM10 DAILY AVERAGE VALUES  
FIRST QUARTER 2008**

(All values are  $\mu\text{g}/\text{m}^3$  at Local temperature and pressure (LTP))

Date	Standard ARCO Wedding FRM South Site	Test ADLC Met One E-BAM Opportunity Site	Difference ( $\mu\text{g}/\text{m}^3$ )	Absolute Difference ( $\mu\text{g}/\text{m}^3$ )	Difference (%)	Absolute Difference (%)	Relative Percent Difference (%)
January 7, 2008	0	0	0	0	0	0	0
January 10, 2008	0	1	1	1	(A)	(A)	200
January 13, 2008	0	2	2	2	(A)	(A)	200
January 19, 2008	3	30	27	27	900	900	164
January 22, 2008	9	18	9	9	100	100	67
January 25, 2008	0	11	11	11	(A)	(A)	200
January 28, 2008	4	7	3	3	75	75	55
February 3, 2008	0	0	0	0	0	0	0
February 6, 2008	1	7	6	6	600	600	150
February 9, 2008	1	0	-1	1	-100	100	200
February 12, 2008	1	0	-1	1	-100	100	200
February 15, 2008	2	0	-2	2	-100	100	200
February 18, 2008	0	7	7	7	(A)	(A)	200
February 21, 2008	9	13	4	4	44	44	36
February 24, 2008	3	6	3	3	100	100	67
February 27, 2008	4	4	0	0	0	0	0
March 1, 2008	3	3	0	0	0	0	0
March 4, 2008	3	6	3	3	100	100	67
March 7, 2008	3	3	0	0	0	0	0
March 10, 2008	1	0	-1	1	-100	100	200
March 13, 2008	3	5	2	2	67	67	50
March 16, 2008	0	0	0	0	0	0	0
March 19, 2008	7	10	3	3	43	43	35
March 22, 2008	3	3	0	0	0	0	0
March 25, 2008	0	10	10	10	(A)	(A)	200
March 28, 2008	2	3	1	1	50	50	40
March 31, 2008	5	13	8	8	160	160	89
Mean			4	4	84	120	97
Maximum			27	27			

(A) Denotes percent differences cannot be calculated because the reference value (ARCO result) is zero.

**Note: Percent differences set to zero when both values are zero.**



**FIGURE 4 – COLLOCATED PM10 RESULTS COMPARISON FOR ADLC OPPORTUNITY E-BAM AND ATLANTIC RICHFIELD WEDDING FRM**

#### 4.0 METEOROLOGICAL DATA SUMMARY

Meteorological data were collected continuously and recorded hourly at both the Opportunity and Warm Springs E-BAM monitoring sites. Parameters monitored include wind direction, wind speed, temperature and relative humidity. The data were collected at a height of approximately eight feet above ground level.

Summarized meteorological data for these sites are presented and discussed in Sections 4.1 and 4.2. Detailed daily meteorological summaries are presented in Attachment A; information presented includes:

- Average, maximum and minimum air (shade) temperature for each day,
- Average and maximum hourly average wind speed for each day,
- Resultant wind direction for each day (weighted by wind speed – this is the mean direction from which the wind was blowing), and
- Average daily relative humidity.

Additionally, the summaries in Attachment 1 show the average daily and maximum daily PM10 concentrations, to facilitate correlation with the meteorological data.

Section 4.3 presents wind rose summaries for periods with elevated PM10 concentrations.

#### 4.1 Opportunity Site

Figure 5 summarizes the meteorological data for the Opportunity site. Winds were generally light, averaging 2.5 m/s (5.6 mph). The highest recorded hourly wind speed was 9.2 m/s (20.6 mph); it is likely that higher short-term gusts have occurred, but the system only monitors hourly average wind speed. Temperatures were near normal in January and March, and above normal in February; they averaged  $-7.0^{\circ}\text{C}$  ( $19.4^{\circ}\text{F}$ ) in January,  $-1.8^{\circ}\text{C}$  ( $28.8^{\circ}\text{F}$ ) in February and  $-1.5^{\circ}\text{C}$  ( $29.3^{\circ}\text{F}$ ) in March. Temperature extremes ranged from a low of less than  $-30.0^{\circ}\text{C}$  ( $-22.0^{\circ}\text{F}$ ) in January to a high of  $12.8^{\circ}\text{C}$  ( $55.0^{\circ}\text{F}$ ) in March (the E-BAM's minimum temperature limit is  $-30.0^{\circ}\text{C}$ ). The average humidity for the quarter was 61%, with considerable daily variation.

Winds at the Opportunity site were mostly from the southwest quadrant. The strongest winds tended to be southwesterly to west-northwesterly.

Minor meteorological data losses occurred due to power outages and routine maintenance. Additionally, in late January and early February 123 hours of meteorological data were lost because of an E-BAM internal pressure sensor problem that required the unit to be removed from service. Other minor wind speed and wind direction data losses occurred due to icing of the instruments.

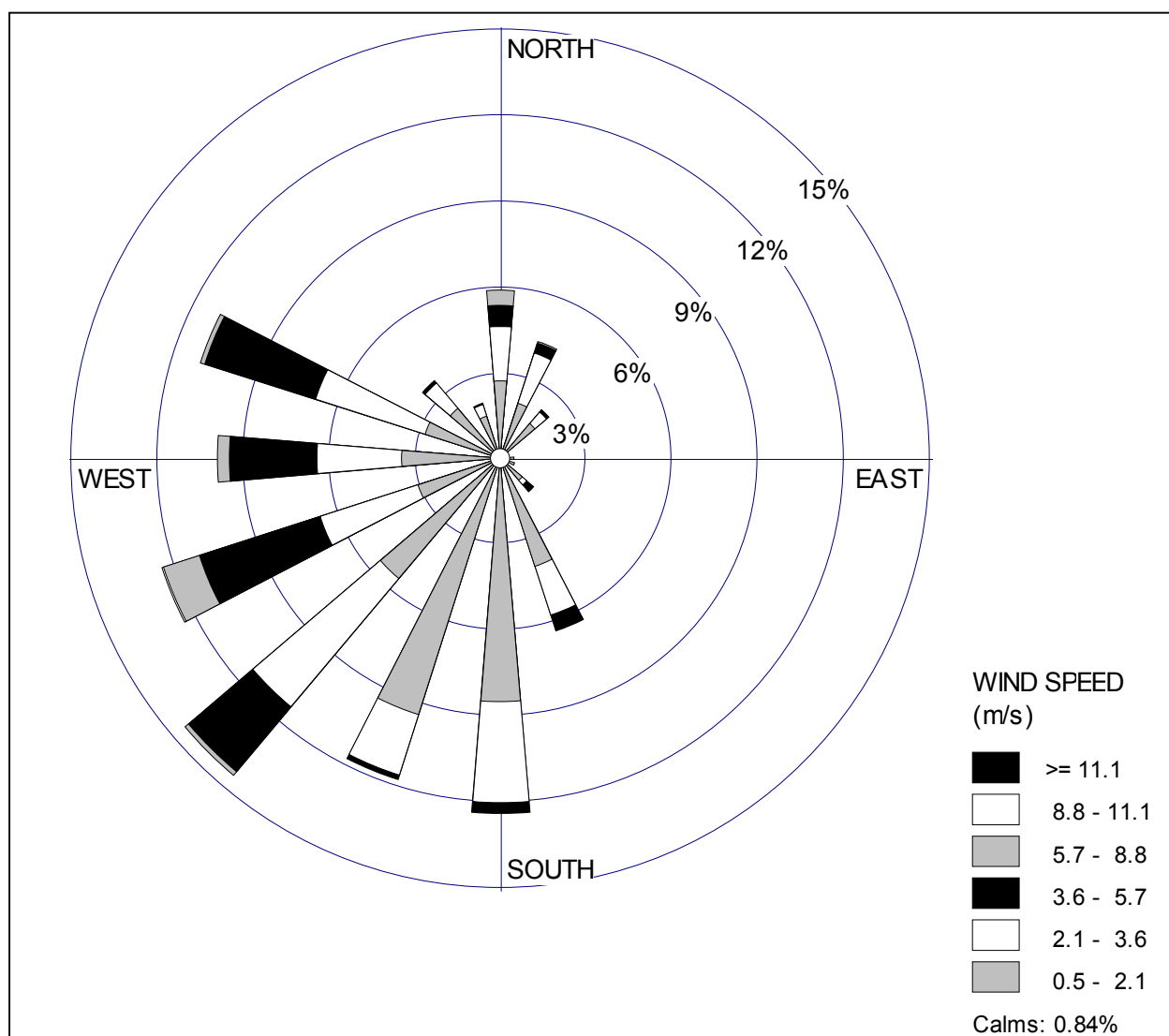
**Part 1 – Means and Extremes**

Parameter	January (1)	February	March	Quarter (1)
Average Wind Speed, m/s	2.5	2.5	2.4	2.5
Maximum (hourly) Wind Speed, m/s	9.2	8.4	7.4	9.2
Average Temperature, °C	-7.0	-1.8	-1.5	-3.2
Maximum Temperature, °C	5.8	10.7	12.8	12.8
Minimum Temperature, °C (2)	<-30.0	-11.7	-13.9	<-30.0
Average Relative Humidity, %	62.2	64.0	58.1	61.3

(1) Monitoring resumed on January 5 following equipment re-certification. Quarterly averages are weighted by number of daily averages available for each month.

(2) EBAM's minimum temperature limit is -30.0 °C

Refer to Attachment A for detailed daily meteorological summaries.

**Part 2 – Quarter 1, 2008 Wind Rose****FIGURE 5 – METEOROLOGICAL SUMMARY FOR OPPORTUNITY SITE**

## 4.2 Warm Springs Site

Figure 6 summarizes the meteorological data for the Warm Springs site. Winds were generally light, averaging 2.4 m/s (5.4 mph). The highest recorded hourly wind speed was 8.7 m/s (19.5 mph); it is likely that higher short-term gusts have occurred, but the system only monitors hourly average wind speed. Temperatures were near normal in January and March, and above normal in February; they averaged  $-6.6^{\circ}\text{C}$  ( $20.1^{\circ}\text{F}$ ) in January,  $-2.1^{\circ}\text{C}$  ( $28.2^{\circ}\text{F}$ ) in February and  $-1.8^{\circ}\text{C}$  ( $28.8^{\circ}\text{F}$ ) in March. Temperature extremes ranged from a low of less than  $-30.0^{\circ}\text{C}$  ( $-22.0^{\circ}\text{F}$ ) in January to a high of  $14.0^{\circ}\text{C}$  ( $57.2^{\circ}\text{F}$ ) in March (the E-BAM's minimum temperature limit is  $-30.0^{\circ}\text{C}$ ). The average humidity for the quarter was 62%, with considerable daily variation.

Winds at the Warm Springs site were mostly from southerly directions. These winds also tended to be the strongest, although fairly strong winds from the west through southwest also occurred at times.

Minor meteorological data losses occurred due to power outages and routine maintenance. Additionally, occasional wind speed and direction data losses occurred due to severe icing of the wind instruments.

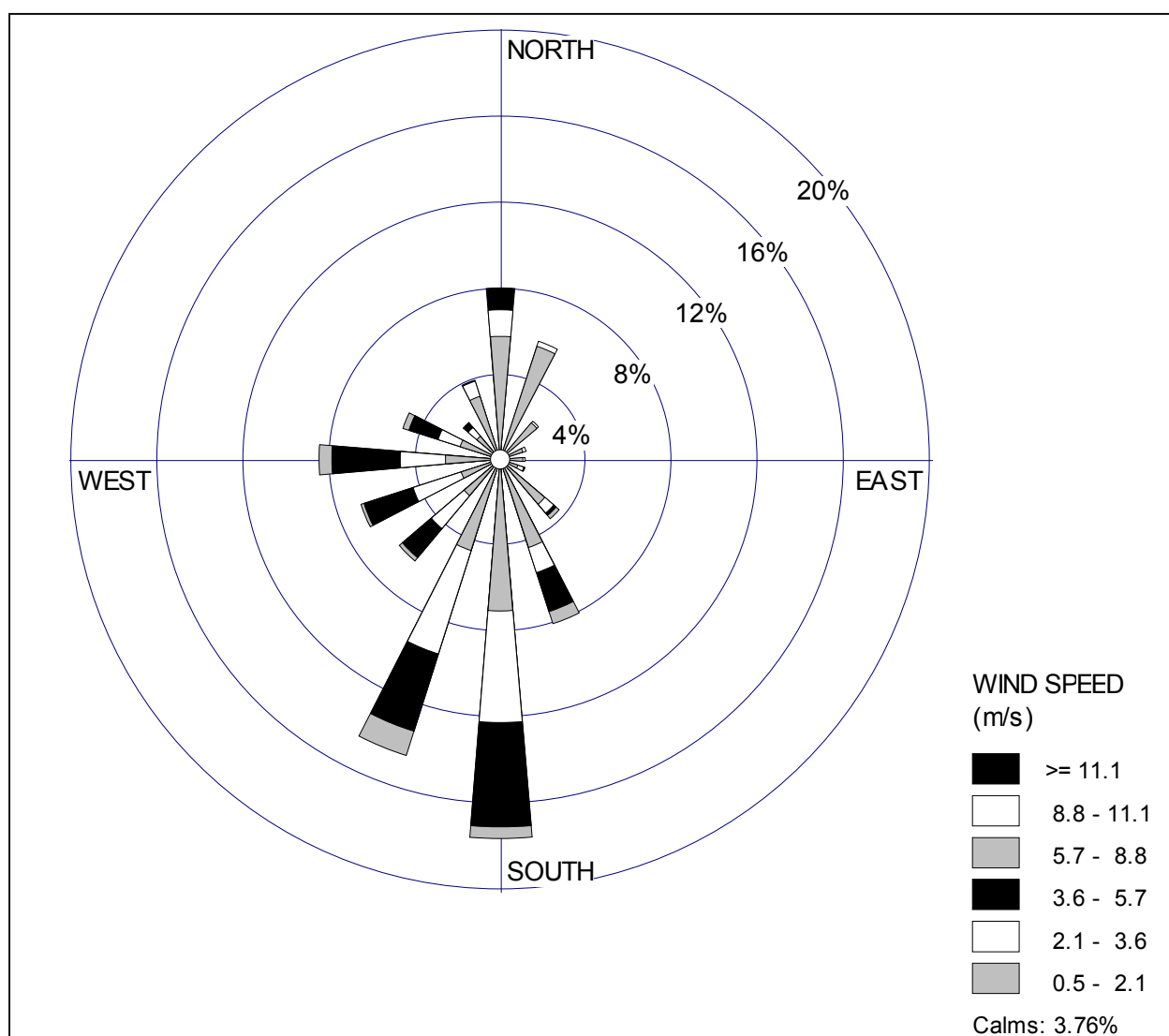
**Part 1 – Means and Extremes**

Parameter	January (1)	February	March	Quarter (1)
Average Wind Speed, m/s	2.6	2.4	2.3	2.4
Maximum (hourly) Wind Speed, m/s	8.7	8.1	7.7	8.7
Average Temperature, °C	-6.6	-2.1	-1.8	-3.4
Maximum Temperature, °C	6.4	12.5	14.0	14.0
Minimum Temperature, °C (2)	<-30.0	-14.7	-14.9	<-30.0
Average Relative Humidity, %	63.2	65.2	59.1	62.4

(1) Monitoring resumed on January 5 following equipment re-certification. Quarterly averages are weighted by number of daily averages available for each month.

(2) EBAM's minimum temperature limit is -30.0 °C

Refer to Attachment A for detailed daily meteorological summaries.

**Part 2 – Quarter 1, 2008 Wind Rose****FIGURE 6 – METEOROLOGICAL SUMMARY FOR WARM SPRINGS SITE**

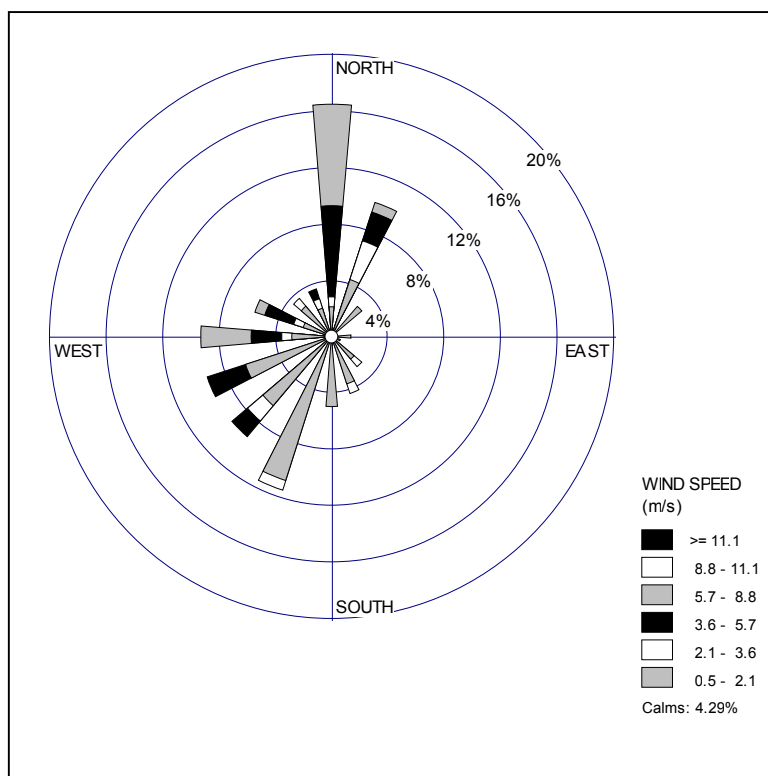
### 4.3 Meteorological Conditions and PM10 Concentrations

Additional wind roses were generated for both monitoring sites to depict wind patterns during periods of elevated PM10 concentrations; they are shown in Figure 7 (Opportunity) and Figure 8 (Warm Springs). For this analysis, “elevated” was defined as concentrations of  $20 \mu\text{g}/\text{m}^3$  or greater. This threshold – equal to approximately three times the average quarterly concentration – was used to ensure that a sufficient volume of data was incorporated to produce meaningful wind rose results. During the first quarter of 2008, differences in wind patterns during elevated particulate levels were more pronounced than in preceding quarters.

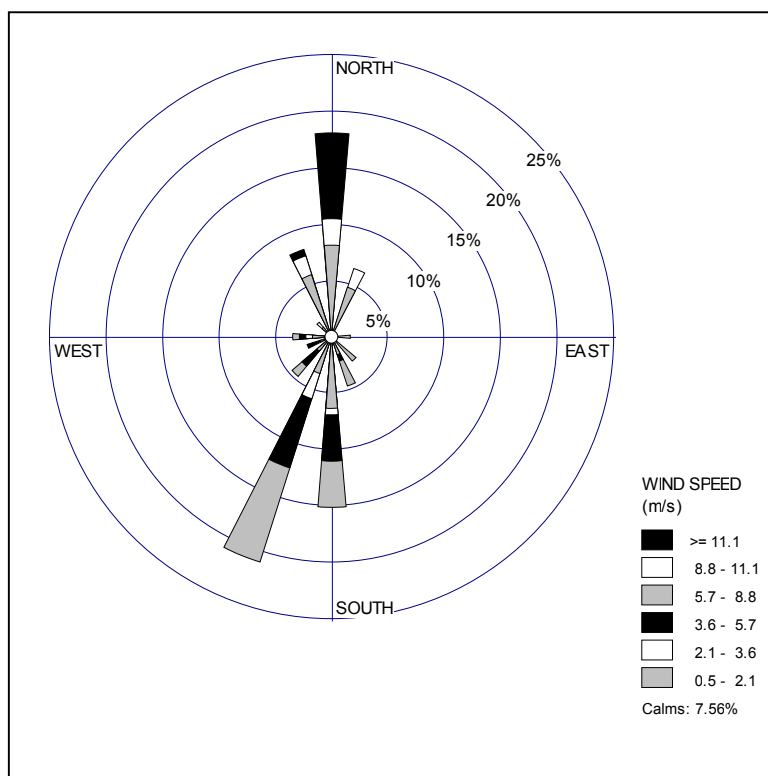
When comparing the wind roses for the Opportunity site (Figures 5 and 7), it is evident that wind speeds were not necessarily higher during elevated particulate conditions – in fact, calm conditions were actually more common during elevated particulate conditions than at other times. However, there was a much higher frequency of northerly winds, which also tended to have noticeably higher speeds. This could reflect episodes of windblown dust from the Opportunity tailings area.

The corresponding wind roses for the Warm Springs site (Figures 6 and 8) show calm winds were also more common during elevated particulate conditions. However, strong northerly winds were considerably more common during elevated particulate conditions than at other times. The high particulate levels during northerly winds are probably not related to tailings areas (which would be downwind at those times), but may result from entrainment of dust from the Montana State Hospital facility grounds and a nearby residential area.





**FIGURE 7 – OPPORTUNITY WIND ROSE FOR ELEVATED PM10 PERIODS**



**FIGURE 8 – WARM SPRINGS WIND ROSE FOR ELEVATED PM10 PERIODS**

## **5.0 DATA QUALITY SUMMARY**

Data quality is an integral part of any ambient monitoring program. The data collected must be of a known quality to be used for evaluation of local air quality and meteorological characteristics. This is particularly important when an objective of a monitoring program is to identify possible emission sources, and meteorological events associated with certain ambient air quality conditions – in this case, elevated inhalable particulate (PM10) levels.

The Opportunity and Warm Springs monitoring systems were checked and/or calibrated (as appropriate for each monitoring parameter) monthly during the first quarter of 2008. This was accomplished via performance checks using standards that were either:

- Traceable to NIST; or
- Otherwise certified by the test equipment manufacturer.

Each instrument response was recorded, and evaluated to determine whether it fell within its respective acceptance range. In the event that a response fell outside (or near the limits of) the applicable acceptance range, the monitor or sensor in question was adjusted or recalibrated as appropriate. Such results then must be evaluated, in conjunction with a detailed data review, to identify data periods that must be flagged or invalidated.

Minor sampler maintenance was also performed on a monthly basis. Additionally, data were reviewed frequently via satellite link, and inspected for any suspicious behavior requiring investigation.

### **5.1 Summary of Performance Check / Maintenance Activities**

Performance checks and minor maintenance were conducted on a monthly basis. Table 2 summarizes checks and maintenance for the E-BAM sampler itself, while Table 3 lists the meteorological checks. Information presented includes:

- The instrument model and serial number for each component of the monitoring system;
- Each type of check/maintenance performed on that component;
- Performance acceptance ranges; and
- A description of the calibration standard (and its traceability) used to perform each check.

### **5.2 Data Quality Issues Identified During Quarter 1, 2008**

In general, performance checks and maintenance activities conducted throughout the first quarter of 2008 indicated that the E-BAM samplers were meeting performance objectives. The performance check procedures, routine maintenance activities and results are discussed in detail in Attachment B. All results obtained during the first quarter of 2008 were satisfactory, with one important exception at the Opportunity site.

On January 26, the meteorological consultant noted a sudden drop in the Opportunity sampler's **indicated** flow rate – from a typical value of 16.6 LPM, down to 16.1 LPM. The behavior was investigated, and the sampler was found to be operating at a flow rate of greater than 20 LPM. The sampler was removed from service, and the manufacturer contacted. A calibration adjustment was made, and the sampler was returned to service on January 28. However, upon checking the unit on January 29 it was apparent that the E-BAM was still not regulating the sampling flow normally. From additional checks and discussion with the manufacturer, the problem was isolated to a failed internal pressure sensor (which helps regulate the sampling flow rate). The sampler again was removed from service, and the pressure sensor was replaced. The sampler was returned to service on February 1, and has functioned properly since. The pressure sensor malfunction resulted in 123 hours of lost PM10 data at the Opportunity site. A similar amount of meteorological data also was lost, since the sampler was removed from service for several days until the replacement part arrived.

Additional, lesser data losses occurred at both monitoring sites during the first quarter of 2008, including the following:

- On January 21 and 22, both samplers stopped operating for several hours because ambient temperatures fell below the E-BAMs' minimum operating temperature of  $-30.0^{\circ}\text{C}$ . The data loss amounted to 10 hours at Opportunity, and 19 hours at Warm Springs. However, the wind speed and direction components continued to function normally during these periods.
- On February 24 and 25, icing of the wind instruments caused losses of wind data of 22 hours at Opportunity, and 18 hours at Warm Springs.
- Additional minor data losses occurred due to power outages and routine maintenance.

Additionally, one PM10 data point from the Opportunity site was excluded from subsequent analyses based on the judgement of project engineers and scientists; the data point is summarized and discussed below:

<b>Date &amp; Time</b>	<b>Opportunity PM10 Readings</b> (previous hour) (current hour) (following hour)	<b>Opportunity PM10 daily average</b> (including suspect data)	<b>Opportunity PM10 daily average</b> (excluding suspect data)	<b>Atlantic Richfield PM10 daily average</b>
02/26/2008 2000 MST	12 <b>589</b> -5	34	9	N/A
All values in micrograms per cubic meter at Local temperature and pressure (LTP)				

At the Opportunity site, occasional, unexplainably high PM10 readings have occurred since the start of the monitoring program – roughly once per month on average (only one such event has occurred at Warm Springs). The readings invariably show the following characteristics:

- The values are always close to  $600\text{ }\mu\text{g}/\text{m}^3$ .
- They are preceded and followed by hourly readings close to zero, which one would not

- expect for an extreme particulate event.
- The values often aren't associated with a strong wind event.
- The E-BAM alarm record does not show a tape overpressure event, which often occurs with true elevated ( $>150 \mu\text{g}/\text{m}^3$ ) PM10 readings.
- The increased daily average value – due to the contribution from the single high reading – is not consistent with the daily average value reported by the Atlantic Richfield PM10 sampler. Because the Atlantic Richfield sampler only operates every third day, this comparison is not always available.

Because the value in question shows all of the above characteristics, it was excluded from subsequent data analyses for this report. An invalidation code of “AM” (miscellaneous void) was assigned to that data point in the AIRS file (Attachment C). The E-BAM manufacturer, Met One, Inc., was contacted to discuss this behavior, and offered a dirty AC power supply and/or high radio frequency (RF) activity in the area as possible causes.

Finally, on January 19 an unusually large difference was observed in the collocated results for the ADLC-Opportunity versus the Atlantic Richfield South samplers. In Section 3.0 it was theorized that unusual meteorological conditions could have affected the E-BAM sampler performance, as suggested by the unusual appearance of the sampling tape dots. Therefore, the ADLC-Opportunity data for the following period (hours ending, inclusive) are flagged as uncertain, but not invalidated:

***Mountain Standard Time:*** January 19 at 2300 MST through January 20 at 1800 MST

***Greenwich Mean Time:*** January 20 at 0600 GMT through January 21 at 0100 GMT

**TABLE 2 – SUMMARY OF PERFORMANCE CHECKS  
E-BAM SAMPLER**

**Met One E-BAM PM<sub>10</sub> Sampler**

Instrument	Model	Serial No.		Check Description			
		<i>OPP</i>	<i>WS</i>	<i>Check Description</i>	<i>Acceptance Range</i>	<i>Check/Cal. Standard</i>	<i>Traceability</i>
PM <sub>10</sub> Sampler	E-BAM	F7290	F7289	Leak Check	<1.5 LPM	BX-302 valve	N/A
				Operating Flow	+/- 2% (+/- 0.33 LPM)	Delta Cal S/N 000498	MFR/NIST
				Pump Test	(1)	BX-302 valve	N/A
				Zero/Span	Pass / Fail	Membrane Plates	MFR
				Clean Vane & Nozzle	(2)	N/A	N/A
				Clean PM10 Head	N/A	N/A	N/A
Barometer (3)	E-BAM	F7290	F7289	Collocated	+/- 2 mmHg	Aneroid Barometer	Mercury Barometer

**Explanatory Notes for Table 2**

N/A = Not applicable

MFR/NIST = Certified traceable to NIST by the manufacturer

MFR = Certified accurate per Met One's E-BAM-6100 Final Test Procedure

(1) Acceptance range varies with test flow rate, see Attachment B for discussion.

(2) Leak check performed following cleaning, result must be <1.5 LPM.

(3) Barometer is internal to E-BAM sampler.

**TABLE 3 – SUMMARY OF PERFORMANCE CHECKS  
METEOROLOGICAL INSTRUMENTS**

**Met One Meteorological Instruments**

<b>Instrument (1)</b>	<b>Model</b>	<b>Serial No.</b>		<b>Check Description</b>			
		<i>OPP</i>	<i>WS</i>	<i>Check Description</i>	<i>Acceptance Range</i>	<i>Check/Cal. Standard</i>	<i>Traceability</i>
Temperature	9250	F9487	F9481	Collocated	+/- 0.5 deg. C	Assmann Psychrometer	NIST
Relative Humidity	593	F9346	F9349	Collocated	+/- 5% Relative Humidity	Assmann Psychrometer	NIST
Wind Speed	0348	G2181	G2187	Collocated	+/- 0.5 m/s	Met One 010 Sensor	NIST
				Rotation Check	+/- 0.2 m/s	Synchronous Motor	MFR
Wind Direction	0348	G2181	G2187	Alignment	+/- 2 degrees	Solar Sighting	NIST Time
				Linearity	+/- 3 degrees	Visual Crossarm Alignment (2)	N/A

**Explanatory Notes for Table 3**

- (1) All meteorological instruments include certificate of NIST traceability from Met One, valid for a period of one year.
- (2) Linearity checked by visually aligning wind vane in 90-degree increments with respect to crossarm.

MFR = Motor rotation rate provided by manufacturer.

**6.0 AIR QUALITY SYSTEM NULL DATA QUALIFIER CODES**

Invalid hours for the quarter are summarized in Table 4 for the Opportunity site, and Table 5 for the Warm Springs site. The complete PM10 data set for the quarter, and current qualifier codes are presented in Attachment C.



**TABLE 4 – OPPORTUNITY SITE INVALID DATA PERIODS  
QUARTER 1, 2008**

*Note: E-BAM system returned to service following re-certification.  
First valid hour was 1-5-2008 @ 2300 GMT (1600 MST)*

**Part A – PM10**

<b>Date</b>	<b>Invalid Hours (ending at) MST</b>	<b>Invalid Hours GMT</b>	<b>Reason</b>	<b>Data Invalidation Code</b>
1-19-2008	1400-1500	2100-2200	Monthly checks	BA
1-21-2008	0300-1000	1000-1700	Ambient temperature below operating range	AO
1-21-2008	1900-2000		Ambient temperature below operating range	AO
1-22-2008		0200-0300	Ambient temperature below operating range	AO
1-25-2008	2000-2300		Sample flow out of range	AH
1-26-2008	0000-1600	0300-2300	Sample flow out of range	AH
1-26-2008	1700-2300		Removed from service	BA
1-27-2008	0000-2300	0000-2300	Removed from service	BA
1-28-2008	0000-1300	0000-2000	Removed from service	BA
1-28-2008	1400-1500	2100-2200	Flow/leak check	BA
1-29-2008	1300-2300	2000-2300	Removed from service	BA
1-30-2008	0000-2300	0000-2300	Removed from service	BA
1-31-2008	0000-2300	0000-2300	Removed from service	BA
2-1-2008	0000-1800	0000-2300	Removed from service	BA
2-2-2008		0000-0100	Removed from service	BA
2-4-2008	1600	2300	Flow/leak check	BA
2-11-2008	1500	2200	Flow/leak check	BA
2-19-2008	1500	2200	Adjusted temperature calibration	BA
2-26-2008	1600	2300	Tape change/flow check	BA
2-26-2008	2000		Suspect sampling error	AM
2-27-2008		0300	Suspect sampling error	AM
2-27-2008	0100, 0600	0800, 1300	Power outage	AV
3-6-2008	1400	2100	Tape change	BA
3-14-2008	0800, 0900, 1100-1400	1500, 1600, 1800-2100	Power outage	AV
3-22-2008	1600	2300	Monthly checks	BA
3-22-2008	1700		Power outage	AV
3-23-2008		0000	Power outage	AV
3-24-2008	1000	1700	Power outage	AV
3-30-2008	1600, 1700, 2000-2300	2300	Power outage	AV
3-31-2008	0000	0000, 0300-0700	Power outage	AV

**TABLE 4 - OPPORTUNITY SITE INVALID DATA PERIODS (continued)**  
**QUARTER 1, 2008**

**Part B – Wind Direction / Wind Speed**

<b>Date</b>	<b>Invalid Hours (ending at) MST</b>	<b>Invalid Hours GMT</b>	<b>Reason</b>	<b>Data Invalidation Code</b>
1-19-2008	1400-1500	2100-2200	Monthly checks	BA
1-26-2008	1700-2300		Removed from service	BA
1-27-2008	0000-2300	0000-2300	Removed from service	BA
1-28-2008	0000-1300	0000-2000	Removed from service	BA
1-29-2008	1300-2300	2000-2300	Removed from service	BA
1-30-2008	0000-2300	0000-2300	Removed from service	BA
1-31-2008	0000-2300	0000-2300	Removed from service	BA
2-1-2008	0000-1800	0000-2300	Removed from service	BA
2-2-2008		0000-0100	Removed from service	BA
2-15-2008	1500	2200	Monthly check	BA
2-19-2008	1500	2200	Adjusted temperature calibration	BA
2-24-2008	1800-2300		Ice on instruments	AO
2-25-2008	0000-1500	0100-2200	Ice on instruments	AO
2-27-2008	0100, 0600	0800, 1300	Power outage	AV
3-14-2008	0800, 0900, 1100-1400	1500, 1600, 1800-2100	Power outage	AV
3-22-2008	1600	2300	Monthly checks	BA
3-22-2008	1700		Power outage	AV
3-23-2008		0000	Power outage	AV
3-24-2008	1000	1700	Power outage	AV
3-30-2008	1600, 1700, 2000-2300	2300	Power outage	AV
3-31-2008	0000	0000, 0300-0700	Power outage	AV

**TABLE 4 - OPPORTUNITY SITE INVALID DATA PERIODS (continued)**  
**QUARTER 1, 2008**

**Part C – Temperature / Relative Humidity**

<b>Date</b>	<b>Invalid Hours (ending at) MST</b>	<b>Invalid Hours GMT</b>	<b>Reason</b>	<b>Data Invalidation Code</b>
1-21-2008	0300-1000	1000-1700	Ambient temperature below operating range	AO
1-21-2008	1900-2000		Ambient temperature below operating range	AO
1-22-2008		0200-0300	Ambient temperature below operating range	AO
1-26-2008	1700-2300		Removed from service	BA
1-27-2008	0000-2300	0000-2300	Removed from service	BA
1-28-2008	0000-1300	0000-2000	Removed from service	BA
1-29-2008	1300-2300	2000-2300	Removed from service	BA
1-30-2008	0000-2300	0000-2300	Removed from service	BA
1-31-2008	0000-2300	0000-2300	Removed from service	BA
2-1-2008	0000-1800	0000-2300	Removed from service	BA
2-2-2008		0000-0100	Removed from service	BA
2-19-2008	1500	2200	Adjusted temperature calibration	BA
2-27-2008	0100, 0600	0800, 1300	Power outage	AV
3-14-2008	0800, 0900, 1100- 1400	1500, 1600, 1800-2100	Power outage	AV
3-22-2008	1700		Power outage	AV
3-23-2008		0000	Power outage	AV
3-24-2008	1000	1700	Power outage	AV
3-30-2008	1600, 1700, 2000- 2300	2300	Power outage	AV
3-31-2008	0000	0000, 0300- 0700	Power outage	AV

**TABLE 5 – WARM SPRINGS SITE INVALID DATA PERIODS  
QUARTER 1, 2008**

*Note: E-BAM system returned to service following re-certification.  
First valid hour was 1-5-2008 @ 2100 GMT (1400 MST)*

**Part A – PM10**

<b>Date</b>	<b>Invalid Hours (ending at) MST</b>	<b>Invalid Hours GMT</b>	<b>Reason</b>	<b>Data Invalidation Code</b>
1-19-2008	1200-1300	1900-2000	Monthly checks	BA
1-21-2008	0100-1100	0800-1800	Ambient temperature below operating range	AO
1-21-2008	1800-2300		Ambient temperature below operating range	AO
1-22-2008	0000-0100	0100-0800	Ambient temperature below operating range	AO
2-7-2008	1600	2300	Tape change	BA
2-15-2008	1400	2100	Monthly check	BA
2-19-2008	1400	2100	Adjusted temperature calibration	BA
2-24-2008	0200-0400	0900-1100	Power outage	AV
3-6-2008	1400	2100	Tape change	BA
3-22-2008	1500	2200	Monthly check	BA

**Part B – Wind Direction / Wind Speed**

<b>Date</b>	<b>Invalid Hours (ending at) MST</b>	<b>Invalid Hours GMT</b>	<b>Reason</b>	<b>Data Invalidation Code</b>
1-19-2008	1200-1300	1900-2000	Monthly checks	BA
2-15-2008	1400	2100	Monthly check	BA
2-19-2008	1400	2100	Adjusted temperature calibration	BA
2-24-2008	0200-0300	0900-1000	Power outage	AV
2-24-2008	1900-2300		Ice on instruments	AO
2-25-2008	0000-1200	0200-1900	Ice on instruments	AO
3-22-2008	1500	2200	Monthly check	BA

**Part C – Temperature / Relative Humidity**

<b>Date</b>	<b>Invalid Hours (ending at) MST</b>	<b>Invalid Hours GMT</b>	<b>Reason</b>	<b>Data Invalidation Code</b>
1-21-2008	0100-1100	0800-1800	Ambient temperature below operating range	AO
1-21-2008	1800-2300		Ambient temperature below operating range	AO
1-22-2008	0000-0100	0100-0800	Ambient temperature below operating range	AO
2-19-2008	1400	2100	Adjusted temperature calibration	BA
2-24-2008	0200-0300	0900-1000	Power outage	AV

## **7.0 REFERENCES**

EPA. August 1998. EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Part 1, Ambient Air Quality Monitoring Program Quality System Development. EPA-45a/R-98-004.

**ATTACHMENT A**  
**METEROLOGICAL SUMMARY SHEETS**  
**FIRST QUARTER 2008**

**OPPORTUNITY DAILY DATA SUMMARY - JANUARY 2008****(Midnight to Midnight, Mountain Standard Time)**

<b>Day</b>	<b>(a) Average Concentration (ug/m3)</b>	<b>(a) Maximum Concentration (ug/m3)</b>	<b>Average Wind Speed (m/s)</b>	<b>Maximum Wind Speed (m/s)</b>	<b>Resultant Wind Direction (degrees) (b)</b>	<b>Average Temperature (deg C)</b>	<b>Maximum Temperature (deg C)</b>	<b>Minimum Temperature (deg C)</b>	<b>Average Relative Humidity (percent)</b>
1	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
2	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
3	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
4	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
5	4	19	4.3	5.8	249	-2.0	1.5	-3.8	56
6	0 (9)	8	2.1	4.2	223	-4.2	-0.7	-7.7	56
7	0	4	2.7	3.6	199	-7.0	-3.0	-11.1	61
8	0	10	3.2	4.2	168	-6.3	-2.4	-11.8	60
9	0 (9)	2	2.6	4.3	238	-2.2	1.7	-5.4	57
10	1	24	3.6	6.5	227	-1.9	0.7	-5.6	61
11	1	17	2.3	4.0	236	0.3	3.6	-1.9	63
12	0	10	2.4	4.7	228	-0.2	2.2	-2.9	61
13	2	17	2.1	4.3	288	-0.1	4.5	-4.9	62
14	2	13	2.9	4.3	193	-0.3	4.2	-6.1	49
15	56	861	4.1	8.2	282	-6.2	1.5	-10.6	54
16	0	9	2.2	4.4	262	-11.6	-7.2	-18.0	56
17	8	26	2.0	3.9	349	-7.1	-4.3	-10.1	77
18	4	15	1.0	2.3	263	-6.1	-3.4	-9.0	77
19	30	382	2.4	6.3	222	-1.9	2.6	-9.1	69
20	66	185	4.7	6.5	5	-18.3	-10.4	-24.4	69
21	35	108	0.9	2.0	185	-23.5	-18.0	<-30.0	56
22	18	41	1.3	2.4	36	-16.8	-11.8	-24.3	64
23	11	42	1.1	3.0	239	-17.6	-11.0	-23.2	71
24	17	68	1.1	1.8	219	-14.5	-9.0	-21.2	70
25	11	44	2.8	5.8	219	-5.9	-0.5	-15.8	62
26	NO DATA	NO DATA	4.9	9.2	229	-1.2	5.8	-4.7	54
27	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
28	7	22	2.8	5.3	278	-8.2	-5.3	-12.3	52
29	0 (9)	6	3.2	4.7	230	-7.9	-5.1	-13.0	58
30	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
31	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA

(a) Values are at Local temperature and pressure (LTP)

(b) Calculations are weighted with corresponding wind speeds

(9) Negative value detected, zero reported



**OPPORTUNITY DAILY DATA SUMMARY - FEBRUARY 2008**

(Midnight to Midnight, Mountain Standard Time)

Day	(a) Average Concentration (ug/m3)	(a) Maximum Concentration (ug/m3)	Average Wind Speed (m/s)	Maximum Wind Speed (m/s)	Resultant Wind Direction (degrees) (b)	Average Temperature (deg C)	Maximum Temperature (deg C)	Minimum Temperature (deg C)	Average Relative Humidity (percent)
1	0 (9)	0	3.4	4.3	235	-5.5	-4.5	-6.4	61
2	0 (9)	7	2.6	4.5	202	-6.1	-1.7	-10.0	55
3	0	9	1.5	2.9	140	-5.7	-2.1	-9.0	59
4	3	34	1.3	2.8	347	-6.5	-2.8	-9.4	68
5	0	8	3.0	4.4	215	-4.4	-1.1	-7.5	58
6	7	74	3.7	5.5	262	-3.9	-1.8	-6.2	54
7	19	72	4.8	8.4	255	-2.7	-0.8	-4.8	64
8	1	16	4.2	6.6	250	-1.5	1.8	-3.2	56
9	0 (9)	3	3.2	5.9	241	3.4	6.8	-1.9	58
10	0 (9)	11	4.3	6.5	239	4.2	6.2	1.0	65
11	0 (9)	8	3.1	4.8	294	1.2	2.6	-0.3	57
12	0 (9)	6	2.9	5.2	243	3.7	6.7	-0.5	65
13	2	18	3.6	5.8	310	-1.2	4.6	-4.1	62
14	0 (9)	4	2.3	3.8	275	-3.2	1.5	-8.2	62
15	0	9	2.1	4.2	205	-0.4	5.5	-7.3	59
16	1	23	3.8	6.4	278	1.9	4.2	-3.1	58
17	5	41	1.6	4.3	319	-4.2	1.1	-8.8	73
18	7	26	1.2	2.5	195	-5.3	2.1	-10.9	70
19	12	34	1.3	3.1	171	-3.6	6.3	-10.0	67
20	8	26	1.1	2.1	227	-3.8	5.3	-10.7	63
21	13	27	1.4	2.9	179	-3.1	7.0	-9.7	66
22	6	26	1.6	4.0	185	-1.5	7.1	-6.8	59
23	10	26	1.3	2.9	229	-2.4	4.6	-8.1	72
24	6	17	1.8	2.3	148	-1.3	1.1	-2.6	80
25	27	61	1.1	1.8	244	-3.8	-2.0	-9.3	86
26	9	30	1.4	2.1	172	-5.4	-0.8	-11.7	75
27	4	38	1.9	3.6	223	-0.3	5.8	-8.7	68
28	1	10	2.6	5.2	281	2.4	5.9	-1.4	65
29	1	11	3.0	4.7	184	3.5	10.7	-2.7	50

(a) Values are at Local temperature and pressure (LTP)

(b) Calculations are weighted with corresponding wind speeds

(9) Negative value detected, zero reported

**OPPORTUNITY DAILY DATA SUMMARY - MARCH 2008**

(Midnight to Midnight, Mountain Standard Time)

Day	(a) Average Concentration (ug/m3)	(a) Maximum Concentration (ug/m3)	Average Wind Speed (m/s)	Maximum Wind Speed (m/s)	Resultant Wind Direction (degrees) (b)	Average Temperature (deg C)	Maximum Temperature (deg C)	Minimum Temperature (deg C)	Average Relative Humidity (percent)
1	3	42	2.4	5.3	276	0.7	5.2	-3.4	59
2	1	9	3.4	4.5	281	-2.0	1.4	-5.1	53
3	1	9	4.9	7.4	239	-1.5	3.1	-5.7	54
4	6	84	2.8	4.9	289	-3.6	0.3	-9.7	67
5	8	46	1.8	3.3	260	-5.8	-2.3	-11.5	71
6	2	15	2.5	4.8	247	-2.4	3.2	-6.6	59
7	3	13	2.6	5.3	237	0.3	6.4	-6.1	52
8	3	11	1.7	3.3	343	-0.3	4.3	-6.3	64
9	4	17	1.4	3.0	4	0.7	7.1	-4.5	67
10	0(9)	4	2.3	4.1	176	3.5	12.8	-5.2	48
11	2	9	3.7	6.7	258	3.8	9.5	-0.5	52
12	1	18	2.6	5.4	278	0.9	6.9	-4.8	41
13	5	17	1.2	2.7	228	-1.1	4.4	-6.0	66
14	6	31	1.6	4.0	228	-1.7	1.2	-4.0	74
15	3	26	1.8	3.8	237	-2.0	1.8	-6.3	69
16	0	9	1.7	3.1	338	-1.4	3.6	-4.4	60
17	0(9)	4	2.9	4.4	260	-0.2	5.0	-4.1	47
18	4	19	2.8	5.3	229	1.5	7.1	-2.6	63
19	10	40	1.8	3.3	263	0.6	6.7	-3.0	58
20	8	46	1.6	3.6	280	-1.8	2.5	-6.3	67
21	2	33	2.6	5.0	273	-2.9	0.2	-5.6	59
22	3	16	1.7	3.4	207	-3.3	4.3	-10.2	48
23	5	13	3.6	6.3	214	2.3	9.9	-5.6	41
24	4	10	4.0	6.0	295	1.3	5.7	-4.6	52
25	10	26	1.6	3.8	7	-4.0	2.1	-10.4	62
26	10	26	1.5	4.1	214	-3.7	3.5	-9.9	65
27	2	22	3.3	5.5	271	-3.6	-0.1	-8.6	48
28	3	23	2.3	4.8	181	-5.1	1.5	-13.4	53
29	1	21	3.0	5.2	278	-5.1	-0.5	-10.5	55
30	1	14	1.7	4.1	245	-7.2	0.3	-13.9	58
31	13	45	1.9	3.7	5	-5.6	-2.0	-9.4	72

(a) Values are at Local temperature and pressure (LTP)

(b) Calculations are weighted with corresponding wind speeds

(9) Negative value detected, zero reported

**WARM SPRINGS DAILY DATA SUMMARY - JANUARY 2008**

(Midnight to Midnight, Mountain Standard Time)

Day	(a) Average Concentration (ug/m3)	(a) Maximum Concentration (ug/m3)	Average Wind Speed (m/s)	Maximum Wind Speed (m/s)	Resultant Wind Direction (degrees) (b)	Average Temperature (deg C)	Maximum Temperature (deg C)	Minimum Temperature (deg C)	Average Relative Humidity (percent)
1	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
2	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
3	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
4	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA	NO DATA
5	0 (9)	12	4.1	5.7	213	-0.7	3.2	-3.1	55
6	0	12	2.9	4.7	197	-3.6	0.9	-10.5	55
7	3	19	2.4	5.1	208	-7.8	-2.3	-13.4	63
8	0	9	4.4	5.7	166	-5.6	-1.7	-11.8	57
9	1	20	2.3	4.9	197	-2.4	2.2	-11.5	62
10	4	34	4.2	6.4	201	-1.8	2.2	-9.7	61
11	1	10	2.5	4.3	225	0.8	4.6	-2.9	63
12	0	20	2.0	4.1	205	-0.5	3.6	-6.1	66
13	2	26	1.0	1.6	59	-1.3	6.1	-10.6	71
14	10	77	4.4	7.4	184	0.7	6.4	-9.8	48
15	2	20	3.1	5.4	290	-6.3	2.7	-12.7	54
16	0	20	1.5	3.7	205	-12.8	-7.6	-19.5	63
17	8	23	1.2	2.1	3	-7.8	-4.3	-11.3	81
18	0	14	0.8	2.4	334	-7.1	-3.7	-10.5	81
19	20	214	2.0	5.1	243	-2.9	2.8	-9.9	74
20	36	123	3.7	5.0	1	-20.1	-11.2	-25.9	67
21	26	76	0.6	0.9	168	-23.6	-22.4	<-30.0	49
22	8	30	0.6	1.1	356	-18.4	-13.2	<-30.0	65
23	9	28	0.6	1.4	49	-20.6	-12.5	-27.8	70
24	17	35	0.5	1.1	351	-19.5	-10.7	-26.3	72
25	20	98	2.4	5.2	199	-7.8	-0.8	-19.2	65
26	57	188	5.4	7.1	188	0.5	5.2	-4.3	57
27	11	78	5.4	8.7	154	2.7	4.3	1.1	51
28	48	423	2.5	4.7	289	-5.6	3.0	-11.1	66
29	14	95	3.9	6.4	200	-6.3	-2.3	-11.6	58
30	0 (9)	9	2.9	5.2	224	-6.1	-1.6	-8.9	54
31	9	55	4.7	6.2	177	-3.7	-2.0	-6.4	65

(a) Values are at Local temperature and pressure (LTP)

(b) Calculations are weighted with corresponding wind speeds

(9) Negative value detected, zero reported

**WARM SPRINGS DAILY DATA SUMMARY - FEBRUARY 2008**

(Midnight to Midnight, Mountain Standard Time)

Day	(a) Average Concentration (ug/m3)	(a) Maximum Concentration (ug/m3)	Average Wind Speed (m/s)	Maximum Wind Speed (m/s)	Resultant Wind Direction (degrees) (b)	Average Temperature (deg C)	Maximum Temperature (deg C)	Minimum Temperature (deg C)	Average Relative Humidity (percent)
1	3	33	3.6	6.6	212	-4.0	0.4	-7.3	57
2	0 (9)	13	3.7	6.1	185	-5.5	-1.2	-8.9	54
3	2	38	1.9	3.8	190	-5.5	-1.5	-9.1	59
4	5	25	1.3	4.4	276	-7.5	-4.2	-12.1	72
5	0	13	4.2	5.6	199	-3.9	-0.2	-7.3	57
6	8	72	3.8	5.6	248	-3.6	-1.3	-5.6	55
7	11	89	5.0	8.1	233	-2.2	1.2	-4.9	62
8	0 (9)	16	2.8	4.6	252	-1.0	2.3	-3.1	55
9	0 (9)	4	3.2	5.8	216	4.5	9.1	-2.2	57
10	0 (9)	7	3.9	5.2	209	5.5	8.8	2.1	62
11	0 (9)	11	2.7	5.3	273	1.3	4.2	-1.4	63
12	0	8	2.5	4.6	214	3.9	9.0	-0.6	69
13	2	27	2.8	6.7	310	-0.5	6.0	-4.7	60
14	0	7	1.6	4.5	162	-3.3	1.5	-11.5	64
15	1	23	1.5	4.4	177	-0.8	5.1	-8.7	64
16	1	21	3.0	5.6	259	2.5	6.2	-3.6	60
17	8	85	1.4	3.8	340	-4.6	1.5	-8.9	75
18	5	17	1.1	2.1	260	-5.7	3.0	-12.2	71
19	7	22	0.8	1.9	0	-6.0	5.6	-14.7	72
20	6	22	0.9	2.0	38	-6.2	6.1	-14.4	69
21	11	25	1.3	2.4	179	-4.0	6.5	-12.6	68
22	8	24	1.3	2.6	126	-3.2	8.4	-12.4	64
23	8	24	1.0	2.7	337	-3.6	4.6	-10.4	75
24	3	12	1.5	2.4	152	-1.4	1.5	-2.7	81
25	26	57	1.0	1.4	222	-4.5	-1.8	-9.0	85
26	12	45	1.3	2.8	210	-6.5	-0.4	-13.7	75
27	5	26	2.3	5.1	218	-1.2	7.1	-9.9	70
28	0	14	2.7	6.2	258	2.3	6.6	-3.4	69
29	0	11	3.8	6.9	176	4.4	12.5	-4.1	50

(a) Values are at Local temperature and pressure (LTP)

(b) Calculations are weighted with corresponding wind speeds

(9) Negative value detected, zero reported

**WARM SPRINGS DAILY DATA SUMMARY - MARCH 2008**

(Midnight to Midnight, Mountain Standard Time)

Day	(a) Average Concentration (ug/m3)	(a) Maximum Concentration (ug/m3)	Average Wind Speed (m/s)	Maximum Wind Speed (m/s)	Resultant Wind Direction (degrees) (b)	Average Temperature (deg C)	Maximum Temperature (deg C)	Minimum Temperature (deg C)	Average Relative Humidity (percent)
1	0	16	2.7	5.7	200	1.1	7.2	-5.1	60
2	0	10	2.8	5.0	274	-2.5	2.5	-5.3	53
3	4	18	4.4	6.5	206	-1.3	3.7	-7.0	53
4	5	75	2.2	3.5	278	-4.0	-0.3	-9.8	68
5	3	21	1.1	2.0	8	-6.5	-1.8	-12.1	73
6	2	14	1.6	3.1	198	-3.3	4.2	-10.4	62
7	1	13	2.4	4.7	227	-0.2	7.7	-6.3	56
8	2	14	1.3	2.3	77	-0.5	5.4	-8.3	65
9	7	119	1.2	1.9	5	0.3	8.1	-5.4	67
10	1	11	2.7	4.2	182	4.1	14.0	-5.7	47
11	3	16	3.5	5.9	215	4.0	10.6	-1.6	53
12	1	9	3.9	6.7	256	1.4	7.7	-3.1	39
13	4	25	1.1	2.5	218	-1.3	5.3	-8.1	66
14	6	47	2.0	4.3	201	-1.0	5.0	-6.6	71
15	2	15	1.6	2.9	234	-2.6	3.3	-8.0	69
16	0	15	1.3	3.2	350	-2.4	3.0	-7.0	64
17	0 (9)	7	3.5	6.3	239	-0.2	5.3	-5.6	48
18	8	40	3.0	5.7	216	1.8	9.2	-3.4	60
19	12	26	1.6	3.2	196	0.4	7.8	-5.7	60
20	10	44	1.8	4.8	264	-1.5	4.6	-6.6	67
21	3	25	2.2	4.8	252	-3.9	0.5	-8.8	63
22	2	18	1.9	3.8	193	-3.6	4.8	-10.7	49
23	15	82	4.4	7.7	196	3.0	11.4	-6.7	40
24	4	13	3.7	6.9	277	1.4	6.2	-6.8	52
25	8	20	1.2	2.3	2	-4.8	2.9	-13.0	62
26	9	58	1.6	3.0	183	-3.9	4.0	-10.7	65
27	3	65	3.1	6.1	266	-4.3	-0.1	-9.7	52
28	3	27	2.5	4.4	183	-5.5	1.6	-14.3	53
29	1	14	2.8	5.5	269	-6.3	-1.7	-11.9	61
30	6	45	2.0	3.8	359	-6.9	1.5	-14.9	63
31	5	19	1.5	2.7	6	-6.0	-1.6	-9.9	70

(a) Values are at Local temperature and pressure (LTP)

(b) Calculations are weighted with corresponding wind speeds

(9) Negative value detected, zero reported

**ATTACHMENT B**

**E-BAM PERFORMANCE CHECK / MAINTENANCE PROCEDURES AND RESULTS  
FIRST QUARTER 2008**

## 1.1 Performance Check / Maintenance Procedures

### 1.1.1 E-BAM Sampler

Several checks are performed on the E-BAM sampler, including both its PM<sub>10</sub> monitoring system and the internal barometric pressure sensor.

#### 1.1.1.1 Leak Check (E-BAM Manual Section 2.4.1.1)

Each month, the E-BAM sampler is checked for leaks in the sampling train that could compromise data integrity. This check is performed by installing a BX-302 valve/filter assembly in place of the PM<sub>10</sub> inlet, and running the sampler in its “pump test” mode while slowly closing the valve. The check is considered satisfactory if the flow drops to below 1.5 LPM.

#### 1.1.1.2 Operating Flow Rate Check (E-BAM Manual Section 2.4.1.5)

The operating flow rate check is performed monthly by installing an NIST-traceable BGI Delta-Cal flow monitor in place of the PM<sub>10</sub> inlet, and comparing the indicated flow against the target of 16.7 LPM. The check is considered satisfactory if the indicated flow is within +/- 2% of the target value. Otherwise, the flow is adjusted at set points of 14.0 LPM and 17.5 LPM, and the operating flow re-checked.

A successful operating flow rate check, when preceded by a successful leak check, proves that the E-BAM sampler is collecting valid PM<sub>10</sub> data.

#### 1.1.1.3 Pump Test (E-BAM Manual Section 2.4.1.7)

The pump test is performed monthly to verify the robustness of the pump; poor results indicate that the pump is nearing the end of its life. The BX-302 valve/filter assembly is installed in place of the PM<sub>10</sub> inlet, and – with the sampler running in the “pump test” mode – partially closed to obtain an indicated flow rate between 14 and 15 LPM. The pump condition pressure reading displayed by the E-BAM then is compared against the appropriate value listed in Figure 34 of the E-BAM manual, providing an evaluation of the pump’s condition.

#### 1.1.1.4 Zero/Span Check (E-BAM Manual Section 2.4.3.1)

Zero and span membrane plates supplied with each sampler are used quarterly to check the calibration of the E-BAM sampler’s beta attenuation detector (The manual indicates this check is not required until after 6 months of operation). These plates simulate specific particulate loads when used in conjunction with a blank filter tape. The checks are performed within the E-BAM sampler’s “membrane test” menu, which directs the user to install and remove the plates at specified times. At the conclusion of the test, the display screen indicates whether the calibration test was successful. The membrane plates are certified by the manufacturer.



#### *1.1.1.5 Clean Valve and Nozzle (E-BAM Manual Section 2.4.5)*

The sampler's sample inlet nozzle (located directly above the filter tape) and vane (located directly beneath the filter tape) are cleaned monthly with a modified Q-tip using isopropyl alcohol. Care is taken that no excess alcohol drips into the vane assembly, which could affect the unit's calibration. Immediately after performing this maintenance, the leak check described in Section 1.1.1.1 is repeated to ensure that the sample train integrity was not compromised.

#### *1.1.1.6 Clean PM<sub>10</sub> Inlet (E-BAM Manual Appendix H)*

Each month the PM<sub>10</sub> inlet is removed from the sampler, disassembled and cleaned using paper towels and isopropyl alcohol. Additionally, all o-rings are lubricated with stopcock grease as necessary.

#### *1.1.1.7 Barometric Pressure Sensor Check (E-BAM Manual Section 2.4.1.4)*

The E-BAM's internal barometer is checked monthly using a Wallace and Tiernan aneroid barometer that is routinely checked against a mercury wall barometer. If the results agree within +/- 2 mmHg, no adjustment is necessary.

### 1.1.2 Meteorological Sensors

#### *1.1.2.1 Temperature (E-BAM Manual Section 2.4.1.3)*

The E-BAM manual specifies a two-point calibration procedure using an ambient temperature and an ice bath. However, the manufacturer indicated that a single-point field calibration check was generally sufficient. Disassembly of the sensor for placement in an ice bath is not trivial, and is impractical as a routine field activity.

The temperature sensor is checked monthly at ambient conditions using an Assmann Psychrometer that has been certified against an NIST-traceable mercury thermometer. If the readings agree to within 0.5 degrees Celsius, no adjustment is necessary.

#### *1.1.2.2 Relative Humidity (Model 593 Relative Humidity Sensor Operation Manual)*

The Model 593 Manual indicates that recalibration (requiring additional specialized equipment) is required only if the sensor element is replaced in the field. Since the entire E-BAM unit will be returned to the manufacturer for annual calibration and maintenance, field replacement of the sensor element is not anticipated. For this project, calibration of the relative humidity sensor will be limited to monthly collocated checks using an Assmann Psychrometer that is certified against an NIST-traceable mercury thermometer. Wet-bulb and dry-bulb temperatures, together with ambient barometric pressure, are used with psychrometric tables to calculate a true relative humidity, which is compared against the E-BAM display. If the indicated relative humidity agrees with that obtained by the Assmann psychrometer to within +/- 5% relative humidity, the results are considered acceptable.

### *1.1.2.3 Wind Speed (Model 034B Wind Sensor Operation Manual)*

The Model 034B Manual recommends an initial check of the unit's response to a known rotation rate. This is being done monthly in the field using a 300 rpm synchronous motor to produce a known wind speed of 18.49 mph (8.27 m/s). The manual specifies an accuracy of  $\pm 0.25$  mph (0.11 m/s) at speeds below 22.7 mph (10.1 m/s). Additionally, the response of the sensor when stopped is observed; it should be  $0.3 \pm 0.1$  m/s.

### *1.1.2.4 Wind Direction (Model 034B Wind Sensor Operation Manual)*

The manual does not specify routine checks for the wind direction sensor, beyond an initial check to confirm that the sensor's readout increases from 0 to 360 degrees as the shaft is turned clockwise. However, routine checks are performed monthly to verify proper operation. First, the sensor's alignment is verified by locking the sensor in place with its alignment pin, and ensuring that a response of between 178 and 182 degrees is obtained. Next, the sensor's linearity is verified by turning it in 90-degree intervals (using the sensor crossarm as a visual reference), and confirming that the E-BAM display's direction indication changes by  $90 \pm 3$  degrees with each step.

The initial orientation of the sensor was performed using a solar sighting in conjunction with NIST time (WWV) to establish precise direction azimuths. The use of solar sightings – rather than magnetic compass readings – negates any localized magnetic influences.

### *1.1.2.5 Filter Temperature and Humidity (E-BAM Manual Sections 2.4.2.1 and 2.4.2.2)*

The E-BAM Manual includes provisions for adjusting the response of both of these parameters. However, there is no practical way to measure either parameter with an external reference standard. Therefore, checks of these parameters will be limited to review of downloaded data files for suspicious behavior.

## **1.2 Performance Check Results**

Each set of performance check results is presented in Appendix A. Results obtained during the first quarter of 2008 were satisfactory with the following exceptions:

- On January 26, the flow rate of the Opportunity sampler was outside acceptance ranges, due to a failed internal pressure sensor. This problem, and the corrective actions taken, are discussed in Section 5.2 of this report.
- After the internal pressure sensor was replaced, the leak check flow rate increased to 0.8 LPM. In the past, it had been at 0.5 LPM or less. The manufacturer indicated this was within the range of normal behavior. Several additional leak checks / flow checks were conducted during the quarter to ensure that a problem wasn't developing.
- Minor adjustments to the temperature sensor calibration were made at both sites on February 19. Several additional checks of the temperature sensors were made during the quarter, with satisfactory results.

**APPENDIX A**  
**PERFORMANCE CHECK RESULTS**

**OPPORTUNITY SITE**

DATE		1/19/2008	1/26/2008	1/28/2008
INITIALS		SH	SH	SH
EBAM OFF-LINE@		1330 MST	1645 MST	Re-activated
EBAM BACK ON-LINE@		1431 MST	Removed	1430 MST
		Monthly Check	(1)	(2)
<b>METEOROLOGICAL PARAMETERS</b>				
Ambient Temperature (+/- 1 deg C)	EBAM-Indicated	-1.3		
	Audit	-1.4		
Ambient RH Check (+/- 5% RH)	EBAM-Indicated	71%		
	Audit (Td/Tw)	-1.4 / -2.9		
	Audit RH	74.6%		
Wind Speed Response (0.2-0.4 m/s stopped)	EBAM-Stopped	0.3		
	EBAM-Spinning	1.1		
Wind Speed - motor (+/- 0.1 m/s)	EBAM-Indicated	8.3		
	Known	8.27		
Ambient BP Check (+/- 2 mm Hg)	EBAM-Indicated	633.2		759.0
	Audit	633.8		617.9
Wind Direction Orientation (178 - 182 deg)	EBAM-Indicated	178		
	(with pin locked)			
Wind Direction Linearity (referenced to crossarm) (+/- 3 deg. linearity)	Along crossarm	153		
	+90 degrees	245		
	+180 degrees	333		
	+270 degrees	64		
	+360 degrees	153		
<b>EBAM SAMPLER</b>				
Leak Check (see 2.4.1.1) (Allowed <1.5 LPM)	Result	<0.5 LPM		<0.5 LPM
	Leak repaired?	N/A		N/A
Operating Flow (see 2.4.1.5) (Target 16.7 LPM, allowed range 16.37-17.03)	As found	16.62	~20.10	16.68
	As left (if recalibrated)	N/A	Wouldn't adjust	N/A
Flow Calibration - Low Flow (if necessary)	As found	N/A		
	As left	N/A		
Flow Calibration - High Flow (if necessary)	As found	N/A		
	As left	N/A		
Pump Test (see 2.4.1.7)	Pressure mm Hg	345 @ 14.2 LPM		
Clean Nozzle (see 2.4.5)	Confirm (X)	X		
Clean PM-10 Inlet (Appdx H)	Confirm (X)	Done 1-4-08		
Zero/Span Verification (Quarterly - see 2.4.3.1)	Zero Pass/Fail	Pass (0.349)		
	Span Pass/Fail	Pass (0.931)		
Confirm Leak Check (after maintenance)	Result	<0.5 LPM		
	Leak repaired?	N/A		
<b>Audit and Calibration Standards</b>	<b>Wind Speed:</b> 300 RPM synchronous motor			
	<b>Temp / RH:</b> Assmann Psychrometer, Dry S/N 6782, Wet S/N 709085			
	<b>Bar. Pressure:</b> W & T Model FA185260, S/N LL03297; Delta Cal S/N 498			
	<b>Wind Direction:</b> Initially oriented using solar sighting			
		<b>EBAM Flows etc.:</b> BGI Delta Cal, S/N 498		

(1) Sampler removed from service due to flow control problem

(2) Adjusted EBAM internal barometer reading, resulting in correct flow

**OPPORTUNITY SITE**

DATE		1/29/2008	2/1/2008	2/4/2008
INITIALS		SH	SH	SH
EBAM OFF-LINE@		1215 MST	Re-activated	1502 MST
EBAM BACK ON-LINE@		Removed	1815 MST	1510 MST
		(1)	(2)	(3)
<b>METEOROLOGICAL PARAMETERS</b>				
Ambient Temperature (+/- 1 deg C)	EBAM-Indicated			-4.2
	Audit			-4.6
Ambient RH Check (+/- 5% RH)	EBAM-Indicated			69%
	Audit (Td/Tw)			-4.6 / -5.6
	Audit RH			80.1%
Wind Speed Response (0.2-0.4 m/s stopped)	EBAM-Stopped			
	EBAM-Spinning			
Wind Speed - motor (+/- 0.1 m/s)	EBAM-Indicated			
	Known			
Ambient BP Check (+/- 2 mm Hg)	EBAM-Indicated	617.9		631.7
	Audit	624		631
Wind Direction Orientation (178 - 182 deg)	EBAM-Indicated (with pin locked)			
Wind Direction Linearity (referenced to crossarm) (+/- 3 deg. linearity)	Along crossarm			
	+90 degrees			
	+180 degrees			
	+270 degrees			
	+360 degrees			
<b>EBAM SAMPLER</b>				
Leak Check (see 2.4.1.1) (Allowed <1.5 LPM)	Result	<0.5 LPM	0.7 LPM	0.7 LPM
	Leak repaired?	N/A	N/A	N/A
Operating Flow (see 2.4.1.5) (Target 16.7 LPM, allowed range 16.37-17.03)	As found	16.45	16.72	16.66
	As left (if recalibrated)	N/A	N/A	N/A
Flow Calibration - Low Flow (if necessary)	As found			
	As left			
Flow Calibration - High Flow (if necessary)	As found			
	As left			
Pump Test (see 2.4.1.7)	Pressure mm Hg			
Clean Nozzle (see 2.4.5)	Confirm (X)			
Clean PM-10 Inlet (Appdx H)	Confirm (X)			
Zero/Span Verification (Quarterly - see 2.4.3.1)	Zero Pass/Fail			
	Span Pass/Fail			
Confirm Leak Check (after maintenance)	Result			
	Leak repaired?			
<b>Audit and Calibration Standards</b>	<b>Wind Speed:</b> 300 RPM synchronous motor			
	<b>Temp / RH:</b> Assmann Psychrometer, Dry S/N 6782, Wet S/N 709085			
	<b>Bar. Pressure:</b> W & T Model FA185260, S/N LL03297; Delta Cal S/N 498			
	<b>Wind Direction:</b> Initially oriented using solar sighting			
		<b>EBAM Flows etc.:</b> BGI Delta Cal, S/N 498		

- (1) Sampler removed from service to replace internal pressure sensor (not responsive to pressure changes)  
 (2) Sampler re-activated after replacing internal pressure sensor  
 (3) Audit RH measurement of uncertain accuracy due to difficult measuring conditions

**OPPORTUNITY SITE**

DATE		2/11/2008	2/15/2008	2/19/2008
INITIALS		SH	SH	SH
EBAM OFF-LINE@		1435 MST	1428 MST	1406 MST
EBAM BACK ON-LINE@		1445 MST	1442 MST	1455 MST
			Monthly check (1)	Monthly check (2)
<b>METEOROLOGICAL PARAMETERS</b>				
Ambient Temperature (+/- 1 deg C)	EBAM-Indicated			5.4 / 4.5
	Audit			4.8 / 4.4
Ambient RH Check (+/- 5% RH)	EBAM-Indicated			45%
	Audit (Td/Tw)			4.8 / 0.2
	Audit RH			42.7%
Wind Speed Response (0.2-0.4 m/s stopped)	EBAM-Stopped		0.3	
	EBAM-Spinning		1.6	
Wind Speed - motor (+/- 0.1 m/s)	EBAM-Indicated		8.3	
	Known		8.27	
Ambient BP Check (+/- 2 mm Hg)	EBAM-Indicated	636.7		633.3
	Audit	637		633
Wind Direction Orientation (178 - 182 deg)	EBAM-Indicated (with pin locked)		178	
Wind Direction Linearity (referenced to crossarm) (+/- 3 deg. linearity)	Along crossarm		153	
	+90 degrees		244	
	+180 degrees		334	
	+270 degrees		65	
	+360 degrees		154	
<b>EBAM SAMPLER</b>				
Leak Check (see 2.4.1.1) (Allowed <1.5 LPM)	Result	0.8 LPM		0.8 LPM
	Leak repaired?	N/A		N/A
Operating Flow (see 2.4.1.5) (Target 16.7 LPM, allowed range 16.37-17.03)	As found	16.78		16.67
	As left (if recalibrated)	N/A		N/A
Flow Calibration - Low Flow (if necessary)	As found			N/A
	As left			N/A
Flow Calibration - High Flow (if necessary)	As found			N/A
	As left			N/A
Pump Test (see 2.4.1.7)	Pressure mm Hg			363 @ 14.4 LPM
Clean Nozzle (see 2.4.5)	Confirm (X)			X
Clean PM-10 Inlet (Appdx H)	Confirm (X)			X
Zero/Span Verification (Quarterly - see 2.4.3.1)	Zero Pass/Fail			N/A
	Span Pass/Fail			N/A
Confirm Leak Check (after maintenance)	Result			0.8 LPM
	Leak repaired?			N/A
<b>Audit and Calibration Standards</b>	<b>Wind Speed:</b> 300 RPM synchronous motor			
	<b>Temp / RH:</b> Assmann Psychrometer, Dry S/N 6782, Wet S/N 709085			
	<b>Bar. Pressure:</b> W & T Model FA185260, S/N LL03297; Delta Cal S/N 498			
	<b>Wind Direction:</b> Initially oriented using solar sighting			
		<b>EBAM Flows etc.:</b> BGI Delta Cal, S/N 498		

(1) Only wind speed and direction were off-line, PM-10 sampling uninterrupted

(2) Temperature response was adjusted. Second set of values is response after adjustment

**OPPORTUNITY SITE**

DATE		2/22/2008	2/26/2008	3/10/2008
INITIALS		SH	SH	SH
EBAM OFF-LINE@		N/A	1530 MST	N/A
EBAM BACK ON-LINE@		N/A	1550 MST	N/A
			(1)	
<b>METEOROLOGICAL PARAMETERS</b>				
Ambient Temperature (+/- 1 deg C)	EBAM-Indicated	7.0		4.6
	Audit	6.8		4.3
Ambient RH Check (+/- 5% RH)	EBAM-Indicated			
	Audit (Td/Tw)			
	Audit RH			
Wind Speed Response (0.2-0.4 m/s stopped)	EBAM-Stopped			
	EBAM-Spinning			
Wind Speed - motor (+/- 0.1 m/s)	EBAM-Indicated			
	Known			
Ambient BP Check (+/- 2 mm Hg)	EBAM-Indicated			
	Audit			
Wind Direction Orientation (178 - 182 deg)	EBAM-Indicated (with pin locked)			
Wind Direction Linearity (referenced to crossarm) (+/- 3 deg. linearity)	Along crossarm			
	+90 degrees			
	+180 degrees			
	+270 degrees			
	+360 degrees			
<b>EBAM SAMPLER</b>				
Leak Check (see 2.4.1.1) (Allowed <1.5 LPM)	Result		0.8 LPM	
	Leak repaired?		N/A	
Operating Flow (see 2.4.1.5) (Target 16.7 LPM, allowed range 16.37-17.03)	As found		16.93 LPM	
	As left (if recalibrated)		N/A	
Flow Calibration - Low Flow (if necessary)	As found			
	As left			
Flow Calibration - High Flow (if necessary)	As found			
	As left			
Pump Test (see 2.4.1.7)	Pressure mm Hg			
Clean Nozzle (see 2.4.5)	Confirm (X)			
Clean PM-10 Inlet (Appdx H)	Confirm (X)			
Zero/Span Verification (Quarterly - see 2.4.3.1)	Zero Pass/Fail			
	Span Pass/Fail			
Confirm Leak Check (after maintenance)	Result			
	Leak repaired?			
<b>Audit and Calibration Standards</b>	<b>Wind Speed:</b> 300 RPM synchronous motor			
	<b>Temp / RH:</b> Assmann Psychrometer, Dry S/N 6782, Wet S/N 709085			
	<b>Bar. Pressure:</b> W & T Model FA185260, S/N LL03297; Delta Cal S/N 498			
	<b>Wind Direction:</b> Initially oriented using solar sighting			
	<b>EBAM Flows etc.:</b> BGI Delta Cal, S/N 498			

(1) Leak check after tape change

**OPPORTUNITY SITE**

DATE		3/22/2008		
INITIALS		SH		
EBAM OFF-LINE@		1532 MST		
EBAM BACK ON-LINE@		1635 MST		
		Monthly check		
<b>METEOROLOGICAL PARAMETERS</b>				
Ambient Temperature (+/- 1 deg C)	EBAM-Indicated	4.6		
	Audit	4.7		
Ambient RH Check (+/- 5% RH)	EBAM-Indicated	20%		
	Audit (Td/Tw)	4.7 / -1.9		
	Audit RH	19.2%		
Wind Speed Response (0.2-0.4 m/s stopped)	EBAM-Stopped	0.3		
	EBAM-Spinning	2.0		
Wind Speed - motor (+/- 0.1 m/s)	EBAM-Indicated	8.3		
	Known	8.27		
Ambient BP Check (+/- 2 mm Hg)	EBAM-Indicated	643.2		
	Audit	643		
Wind Direction Orientation (178 - 182 deg)	EBAM-Indicated	178		
	(with pin locked)			
Wind Direction Linearity (referenced to crossarm) (+/- 3 deg. linearity)	Along crossarm	155		
	+90 degrees	246		
	+180 degrees	335		
	+270 degrees	66		
	+360 degrees	154		
<b>EBAM SAMPLER</b>				
Leak Check (see 2.4.1.1) (Allowed <1.5 LPM)	Result	0.8 LPM		
	Leak repaired?	N/A		
Operating Flow (see 2.4.1.5) (Target 16.7 LPM, allowed range 16.37-17.03)	As found	16.89		
	As left (if recalibrated)	N/A		
Flow Calibration - Low Flow (if necessary)	As found	N/A		
	As left	N/A		
Flow Calibration - High Flow (if necessary)	As found	N/A		
	As left	N/A		
Pump Test (see 2.4.1.7)	Pressure mm Hg	340 @ 14.2 LPM		
Clean Nozzle (see 2.4.5)	Confirm (X)	X		
Clean PM-10 Inlet (Appdx H)	Confirm (X)	X		
Zero/Span Verification (Quarterly - see 2.4.3.1)	Zero Pass/Fail	N/A		
	Span Pass/Fail	N/A		
Confirm Leak Check (after maintenance)	Result	0.8 LPM		
	Leak repaired?	N/A		
<b>Audit and Calibration Standards</b>	<b>Wind Speed:</b> 300 RPM synchronous motor			
	<b>Temp / RH:</b> Assmann Psychrometer, Dry S/N 6782, Wet S/N 709085			
	<b>Bar. Pressure:</b> W & T Model FA185260, S/N LL03297; Delta Cal S/N 498			
	<b>Wind Direction:</b> Initially oriented using solar sighting			
		<b>EBAM Flows etc.:</b> BGI Delta Cal, S/N 498		



**WARM SPRINGS SITE**

DATE		1/19/2008	2/4/2008	2/15/2008
INITIALS		SH	SH	SH
EBAM OFF-LINE@		1200 MST	N/A	1302 MST
EBAM BACK ON-LINE@		1300 MST	N/A	1357 MST
		Monthly check		Monthly check
<b>METEOROLOGICAL PARAMETERS</b>				
Ambient Temperature (+/- 1 deg C)	EBAM-Indicated	4.3	-4.0	
	Audit	3.6	-4.3	
Ambient RH Check (+/- 5% RH)	EBAM-Indicated	54%	68%	
	Audit (Td/Tw)	3.6 / -0.2	-4.3 / -5.7	
	Audit RH	49.6%	72.6%	
Wind Speed Response (0.2-0.4 m/s stopped)	EBAM-Stopped	0.3		0.3
	EBAM-Spinning	4.0		1.6
Wind Speed - motor (+/- 0.1 m/s)	EBAM-Indicated	8.3		8.3
	Known	8.27		8.27
Ambient BP Check (+/- 2 mm Hg)	EBAM-Indicated	636.4		640.4
	Audit	637.8		640
Wind Direction Orientation (178 - 182 deg)	EBAM-Indicated	178		178
	(with pin locked)			
Wind Direction Linearity (referenced to crossarm) (+/- 3 deg. linearity)	Along crossarm	190		189
	+90 degrees	280		281
	+180 degrees	12		9
	+270 degrees	100		98
	+360 degrees	189		189
<b>EBAM SAMPLER</b>				
Leak Check (see 2.4.1.1) (Allowed <1.5 LPM)	Result	<0.5 LPM		<0.5 LPM
	Leak repaired?	N/A		N/A
Operating Flow (see 2.4.1.5) (Target 16.7 LPM, allowed range 16.37-17.03)	As found	16.40		16.83
	As left (if recalibrated)	16.60		N/A
Flow Calibration - Low Flow (if necessary)	As found	13.8		N/A
	As left	14.0		N/A
Flow Calibration - High Flow (if necessary)	As found	17.1		N/A
	As left	17.5		N/A
Pump Test (see 2.4.1.7)	Pressure mm Hg	360 @ 14.6 LPM		378 @ 14.8 LPM
Clean Nozzle (see 2.4.5)	Confirm (X)	X		X
Clean PM-10 Inlet (Appdx H)	Confirm (X)	Done 1-4-08		X
Zero/Span Verification (Quarterly - see 2.4.3.1)	Zero Pass/Fail	Pass (0.358)		N/A
	Span Pass/Fail	Pass (0.956)		N/A
Confirm Leak Check (after maintenance)	Result	<0.5 LPM		<0.5 LPM
	Leak repaired?	N/A		N/A
<b>Audit and Calibration Standards</b>	<b>Wind Speed:</b> 300 RPM synchronous motor			
	<b>Temp / RH:</b> Assmann Psychrometer, Dry S/N 6782, Wet S/N 709085			
	<b>Bar. Pressure:</b> W & T Model FA185260, S/N LL03297; Delta Cal S/N 498			
	<b>Wind Direction:</b> Initially oriented using solar sighting			
		<b>EBAM Flows etc.:</b> BGI Delta Cal, S/N 498		

**WARM SPRINGS SITE**

DATE		2/19/2008	2/22/2008	3/10/2008
INITIALS		SH	SH	SH
EBAM OFF-LINE@		N/A	N/A	N/A
EBAM BACK ON-LINE@		N/A	N/A	N/A
		Monthly check (1)		
METEOROLOGICAL PARAMETERS				
Ambient Temperature (+/- 1 deg C)	EBAM-Indicated	4.4 / 3.6	6.5	6.0
	Audit	3.3 / 3.5	6.6	5.8
Ambient RH Check (+/- 5% RH)	EBAM-Indicated	44%		
	Audit (Td/Tw)	3.3 / -1.0		
	Audit RH	42.8%		
Wind Speed Response (0.2-0.4 m/s stopped)	EBAM-Stopped			
	EBAM-Spinning			
Wind Speed - motor (+/- 0.1 m/s)	EBAM-Indicated			
	Known			
Ambient BP Check (+/- 2 mm Hg)	EBAM-Indicated			
	Audit			
Wind Direction Orientation (178 - 182 deg)	EBAM-Indicated (with pin locked)			
Wind Direction Linearity (referenced to crossarm) (+/- 3 deg. linearity)	Along crossarm			
	+90 degrees			
	+180 degrees			
	+270 degrees			
	+360 degrees			
EBAM SAMPLER				
Leak Check (see 2.4.1.1) (Allowed <1.5 LPM)	Result			
	Leak repaired?			
Operating Flow (see 2.4.1.5) (Target 16.7 LPM, allowed range 16.37-17.03)	As found			
	As left (if recalibrated)			
Flow Calibration - Low Flow (if necessary)	As found			
	As left			
Flow Calibration - High Flow (if necessary)	As found			
	As left			
Pump Test (see 2.4.1.7)	Pressure mm Hg			
Clean Nozzle (see 2.4.5)	Confirm (X)			
Clean PM-10 Inlet (Appdx H)	Confirm (X)			
Zero/Span Verification (Quarterly - see 2.4.3.1)	Zero Pass/Fail			
	Span Pass/Fail			
Confirm Leak Check (after maintenance)	Result			
	Leak repaired?			
<b>Audit and Calibration Standards</b>	<b>Wind Speed:</b> 300 RPM synchronous motor			
	<b>Temp / RH:</b> Assmann Psychrometer, Dry S/N 6782, Wet S/N 709085			
	<b>Bar. Pressure:</b> W & T Model FA185260, S/N LL03297; Delta Cal S/N 498			
	<b>Wind Direction:</b> Initially oriented using solar sighting			
	<b>EBAM Flows etc.:</b> BGI Delta Cal, S/N 498			

(1) Temperature sensor response was adjusted. Second set of values is response after adjustment

**WARM SPRINGS SITE**

DATE		3/22/2008		
INITIALS		SH		
EBAM OFF-LINE@		1406 MST		
EBAM BACK ON-LINE@		1456 MST		
		Monthly checks		
<b>METEOROLOGICAL PARAMETERS</b>				
Ambient Temperature (+/- 1 deg C)	EBAM-Indicated	3.4		
	Audit	3.9		
Ambient RH Check (+/- 5% RH)	EBAM-Indicated	23%		
	Audit (Td/Tw)	3.9 / -2.2		
	Audit RH	22.1%		
Wind Speed Response (0.2-0.4 m/s stopped)	EBAM-Stopped	0.3		
	EBAM-Spinning	1.5		
Wind Speed - motor (+/- 0.1 m/s)	EBAM-Indicated	8.3		
	Known	8.27		
Ambient BP Check (+/- 2 mm Hg)	EBAM-Indicated	646.5		
	Audit	647		
Wind Direction Orientation (178 - 182 deg)	EBAM-Indicated	178		
	(with pin locked)			
Wind Direction Linearity (referenced to crossarm) (+/- 3 deg. linearity)	Along crossarm	191		
	+90 degrees	102		
	+180 degrees	9		
	+270 degrees	281		
	+360 degrees	191		
<b>EBAM SAMPLER</b>				
Leak Check (see 2.4.1.1) (Allowed <1.5 LPM)	Result	<0.5 LPM		
	Leak repaired?	N/A		
Operating Flow (see 2.4.1.5) (Target 16.7 LPM, allowed range 16.37-17.03)	As found	16.94		
	As left (if recalibrated)	N/A		
Flow Calibration - Low Flow (if necessary)	As found	N/A		
	As left	N/A		
Flow Calibration - High Flow (if necessary)	As found	N/A		
	As left	N/A		
Pump Test (see 2.4.1.7)	Pressure mm Hg	344 @ 14.2 LPM		
Clean Nozzle (see 2.4.5)	Confirm (X)	X		
Clean PM-10 Inlet (Appdx H)	Confirm (X)	X		
Zero/Span Verification (Quarterly - see 2.4.3.1)	Zero Pass/Fail	N/A		
	Span Pass/Fail	N/A		
Confirm Leak Check (after maintenance)	Result	<0.5 LPM		
	Leak repaired?	N/A		
<b>Audit and Calibration Standards</b>	<b>Wind Speed:</b> 300 RPM synchronous motor			
	<b>Temp / RH:</b> Assmann Psychrometer, Dry S/N 6782, Wet S/N 709085			
	<b>Bar. Pressure:</b> W & T Model FA185260, S/N LL03297; Delta Cal S/N 498			
	<b>Wind Direction:</b> Initially oriented using solar sighting			
		<b>EBAM Flows etc.:</b> BGI Delta Cal, S/N 498		

**ATTACHMENT C**

**AIR QUALITY SYSTEM NULL DATA QUALIFIER CODES  
FIRST QUARTER 2008**

**Opportunity Site January 2008** (All values are micrograms per cubic meter at Local temperature and pressure)

Hour Beginning																										
DAY	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	OBS	MEAN
1	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	0	#DIV/0!
2	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	0	#DIV/0!
3	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	0	#DIV/0!
4	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	0	#DIV/0!
5	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	19	14	0	4	3	0	-3	3	-5	9	3.9
6	-4	-2	-4	-2	-3	0	-1	-5	-4	-5	-3	4	1	-3	8	0	2	-2	0	6	-4	-5	4	-5	24	-1.1
7	0	1	4	1	-3	2	-1	4	-1	-4	-2	-5	3	-3	4	1	0	-1	4	-3	1	-1	-1	4	24	0.2
8	10	-1	-2	6	3	-5	-2	-5	-5	-4	1	-1	-5	2	-5	6	4	-1	-5	4	0	0	9	-5	24	0.0
9	1	1	0	1	-2	-4	-2	-2	-5	-5	-2	-5	2	-5	-4	2	-1	2	0	2	1	-1	-1	2	24	-1.0
10	-3	0	-5	-5	4	14	0	-1	-2	-4	2	7	3	-1	0	2	-5	24	-5	6	-3	-3	5	-5	24	1.0
11	0	12	-5	-1	-1	-2	0	-4	2	-4	-1	0	-4	-5	4	4	2	-2	-1	6	17	12	6	0	24	1.5
12	10	-3	1	5	1	-5	-2	-1	-5	4	-5	-2	0	-5	6	-4	-1	-1	2	1	-5	-2	0	3	24	-0.3
13	3	2	4	3	12	-5	-5	1	-3	-5	-2	4	-2	-5	2	4	3	0	12	17	4	-2	-2	2	24	1.8
14	-2	3	-3	3	-3	0	-4	-2	2	-1	-5	8	6	9	-2	13	6	2	-1	10	-4	12	-5	6	24	2.0
15	8	0	211	861	87	113	21	2	4	2	0	-5	14	23	11	4	8	-1	-5	-3	-4	-3	-1	0	24	56.1
16	3	-2	7	-4	2	0	2	7	-5	-5	-5	3	-3	-4	-2	0	7	2	-2	-4	9	-5	-5	-5	24	-0.4
17	-1	-2	-5	2	2	3	-1	-5	-5	-1	18	21	4	10	26	14	21	24	19	22	7	5	4	7	24	7.9
18	8	2	7	-5	-5	12	6	7	3	2	15	-5	1	-5	9	2	2	9	10	3	-4	-1	9	12	24	3.9
19	8	5	5	-1	3	7	5	-3	-3	-5	-2	-4	-5	BA	BA	-1	0	-2	4	3	1	7	257	382	22	30.0
20	104	130	88	85	113	185	82	38	84	64	93	76	68	91	65	57	51	41	10	16	19	4	11	11	24	66.1
21	33	9	AO	AO	AO	AO	AO	AO	AO	AO	20	39	38	68	67	108	47	24	AO	AO	31	9	-2	3	14	35.3
22	0	7	11	29	8	18	14	11	15	15	20	28	4	16	12	10	41	26	20	35	26	17	27	32	24	18.4
23	16	1	9	19	7	5	10	2	-5	12	10	9	17	6	6	13	16	21	25	42	17	14	0	-3	24	11.2
24	8	7	4	8	13	-2	7	1	6	-5	-5	16	6	20	11	20	24	32	27	31	15	54	68	30	24	16.5
25	14	31	6	44	-5	24	-5	2	-5	0	36	23	22	18	1	-1	1	3	-5	AH	AH	AH	AH	AH	19	10.7
26	AH	AH	AH	AH	AH	AH	AH	AH	AH	AH	AH	AH	AH	AH	AH	AH	BA	BA	BA	BA	BA	BA	BA	BA	0	#DIV/0!
27	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	0	#DIV/0!
28	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	8	-5	-2	17	1	19	4	-1	22	9	7.0
29	3	-2	-5	-5	-5	-4	-3	6	-4	-5	5	3	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	12	-1.3
30	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	0	#DIV/0!
31	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	0	#DIV/0!
NO.	21	21	20	20	20	20	20	20	20	20	21	21	20	19	19	22	22	22	21	20	21	21	21	21		
MAX.	104	130	211	861	113	185	82	38	84	64	93	76	68	91	67	108	51	41	27	42	31	54	257	382		
AVG.	10	9	16	52	11	18	6	3	3	2	9	10	9	12	12	13	11	9	6	10	7	5	18	23		

Note: Negative values will be addressed with development of a detection limit in the annual report.

**Opportunity Site February 2008** (All values are micrograms per cubic meter at Local temperature and pressure)

DAY	Hour Beginning																							OBS	MEAN	
	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200			2300
1	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	-2	-5	-4	0	0	-3	6	-2.3
2	-1	-5	-5	-2	7	0	-5	-5	2	-5	1	-5	-5	-3	-5	-1	6	2	-3	-4	-5	3	0	-1	24	-1.7
3	-4	2	-2	4	-1	0	-4	-4	4	-1	3	3	9	-3	6	1	-4	6	0	-1	-5	2	-1	-1	24	0.4
4	-5	3	7	5	10	-1	4	4	10	6	6	-2	6	34	5	BA	3	-5	-5	-1	-4	7	-5	-2	23	3.5
5	2	-4	-2	-5	-3	1	-5	2	-2	-5	-4	-5	-1	-2	2	-3	3	5	3	3	-1	1	3	8	24	-0.4
6	54	74	14	-3	-1	26	0	2	-5	0	4	6	1	-2	10	8	-5	-4	1	-5	-5	-3	-3	-4	24	6.7
7	-1	-5	-2	-5	4	21	5	11	16	8	56	43	72	69	16	47	16	50	19	8	2	-3	0	6	24	18.9
8	1	-1	2	-4	0	-2	-3	-5	6	2	3	-4	4	-2	4	3	16	-1	-1	-5	3	0	7	-5	24	0.8
9	-5	3	-4	-5	1	-3	2	1	-1	1	-1	-2	-1	-2	0	-5	-2	2	0	0	-5	-5	-2	-2	24	-1.5
10	-5	4	-1	-2	-5	-4	-4	-4	-1	-5	-5	-5	-4	2	-2	1	-3	-2	-5	3	3	3	11	-5	24	-1.5
11	-2	-1	4	1	-5	-5	-4	-2	3	-4	0	2	-3	1	BA	-1	-4	5	1	-5	-5	-3	8	4	23	-0.7
12	6	-5	-4	-3	1	0	-3	-5	-3	-4	1	-1	-5	-3	-2	-5	0	-2	-2	1	-4	2	1	-2	24	-1.7
13	5	1	-5	7	9	-5	0	-2	-4	2	-4	1	-2	2	4	1	18	16	0	5	-5	1	-3	-5	24	1.5
14	-4	-1	1	-1	1	2	-3	3	-5	-5	3	-1	-5	-5	-3	4	-1	2	-4	-4	-4	-1	-3	1	24	-1.4
15	1	-3	1	3	-2	0	-1	3	-5	-1	-2	1	-5	-5	3	5	-1	9	3	-3	6	-5	2	-5	24	0.0
16	-2	8	-1	3	-5	5	-5	-5	-2	0	-4	-3	-3	-1	1	-5	-1	-2	-5	-4	1	23	1	18	24	0.5
17	33	41	23	3	0	-5	-5	3	0	0	-5	-4	-5	7	3	-3	0	6	-5	0	5	9	5	18	24	5.2
18	9	1	14	2	-1	11	10	11	1	-3	-1	5	6	7	-5	8	12	3	9	7	13	12	1	26	24	6.6
19	5	4	3	-5	21	19	2	-5	34	5	-2	6	5	15	BA	13	10	21	9	30	31	18	24	21	23	12.3
20	6	6	7	2	8	7	13	-2	-3	6	3	10	-1	0	3	13	14	14	9	16	17	7	26	17	24	8.3
21	11	17	14	17	14	13	15	11	4	7	3	1	8	9	6	13	10	14	19	22	17	23	27	11	24	12.8
22	11	4	0	6	5	-1	0	-5	1	-2	7	0	4	1	0	7	8	17	4	26	18	11	19	14	24	6.5
23	11	19	9	17	15	9	11	4	3	9	8	8	6	7	6	11	6	9	-4	20	12	26	5	2	24	9.5
24	3	-2	-1	4	4	-3	6	7	5	1	13	-2	2	2	4	11	11	13	8	17	3	13	12	14	24	6.0
25	11	3	24	26	29	32	26	30	34	17	22	22	43	35	61	18	30	17	33	41	-3	57	-5	38	24	26.7
26	26	19	27	10	19	-5	30	4	16	5	2	1	-5	7	9	BA	4	7	12	AM	-5	5	12	-2	22	9.0
27	AV	18	38	7	-5	AV	7	6	5	4	-4	3	2	6	3	4	-1	4	1	-2	-3	-5	-1	-2	22	3.9
28	-4	1	-1	2	1	-3	1	-1	3	-2	2	-2	10	-5	8	-4	1	-1	-1	3	1	6	-1	1	24	0.6
29	2	0	-2	-5	-1	2	-1	3	4	-5	6	3	1	-1	3	1	-3	3	1	11	-3	-1	6	1	24	1.0
NO.	27	28	28	28	28	27	28	28	28	28	28	28	28	28	26	26	28	28	29	28	29	29	29	29	29	
MAX.	54	74	38	26	29	32	30	30	34	17	56	43	72	69	61	47	30	50	33	41	31	57	27	38		
AVG.	6	7	6	3	4	4	3	2	4	1	4	3	5	6	5	5	5	7	3	6	2	7	5	6		

Note: Negative values will be addressed with development of a detection limit in the annual report.

**Opportunity Site March 2008**

(All values are micrograms per cubic meter at Local temperature and pressure)

Hour Beginning																										
DAY	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	OBS	MEAN
1	-1	3	-3	4	3	2	-1	25	11	-1	-2	-5	-2	0	42	2	-4	4	1	-4	-5	-4	-3	-1	24	2.5
2	0	0	-5	2	-1	-5	2	-5	3	-5	1	-4	1	3	-1	2	0	6	6	9	-2	5	5	2	24	0.8
3	-2	4	1	1	2	2	2	-5	-5	2	1	-3	-2	4	-5	9	7	4	-4	0	6	-1	3	3	24	1.0
4	2	-5	-3	-2	-5	2	-3	1	0	-5	-2	-5	-2	5	1	84	21	3	7	10	4	30	10	7	24	6.5
5	2	3	8	6	8	-1	-1	4	46	6	11	5	19	35	-1	7	-5	10	8	-1	5	7	2	1	24	7.7
6	2	2	-5	-5	1	-1	-3	0	-4	8	0	-5	-2	BA	5	5	0	-3	15	13	13	5	3	2	23	2.0
7	5	0	9	8	1	-2	2	-4	6	-1	0	2	3	1	0	1	2	1	1	1	2	7	13	4	24	2.6
8	7	5	2	9	7	11	5	-5	6	-5	7	-1	2	-1	5	2	1	5	-5	1	1	1	0	3	24	2.6
9	2	17	10	10	14	9	11	-5	-2	-2	3	3	0	0	-3	-3	1	6	4	7	2	10	3	9	24	4.4
10	-1	1	-2	2	-4	-2	4	-5	-2	3	-2	2	-3	-2	2	-2	0	2	3	-5	0	1	-1	-2	24	-0.5
11	0	0	1	4	5	-1	-1	1	-1	-5	7	5	-2	3	7	9	-5	4	7	0	-3	6	-1	0	24	1.7
12	9	1	-2	-1	2	-5	6	-4	1	1	-5	-2	-1	3	0	1	1	4	-5	-2	1	6	6	18	24	1.4
13	8	4	1	6	9	1	-3	5	1	4	-4	0	-1	-3	-4	4	7	6	14	4	10	17	17	8	24	4.6
14	31	21	15	14	-1	-5	3	AV	AV	7	AV	AV	AV	AV	6	4	2	1	2	-2	3	-1	3	4	18	5.9
15	-5	4	26	12	2	20	19	-5	-4	-5	-2	-5	-2	2	-5	5	1	3	3	3	-4	2	-1	-2	24	2.6
16	2	1	4	-1	2	-5	2	-5	-5	-5	7	5	-5	-5	0	9	-5	0	0	-5	-4	2	6	-2	24	-0.3
17	-5	-5	-4	-5	-2	-5	-1	-5	-4	4	2	-2	4	1	1	1	0	-5	0	-3	1	-3	0	0	24	-1.5
18	-1	-2	2	8	0	0	4	-5	4	-3	-1	7	9	4	0	10	13	2	3	3	-2	14	6	19	24	3.9
19	8	8	4	6	7	0	7	-5	32	11	6	5	6	5	4	9	8	17	23	-1	40	-3	19	26	24	10.1
20	9	40	46	9	40	9	5	13	-5	-3	-2	4	3	-4	-1	3	0	-3	6	3	6	2	-1	19	24	8.3
21	-3	6	1	3	0	3	5	-3	2	-1	33	-1	-5	-5	14	0	-1	6	1	1	4	-1	-4	2	24	2.4
22	2	-2	5	-2	-5	3	6	-5	-3	2	-5	4	-5	-3	4	BA	AV	6	11	9	16	14	-1	4	22	2.5
23	5	-2	1	9	8	3	-1	4	5	12	11	0	-3	2	3	9	13	10	9	0	13	10	1	-4	24	4.9
24	3	6	5	7	10	-5	7	-5	-1	AV	-1	3	5	1	1	6	7	9	1	9	6	5	2	10	23	4.0
25	7	7	11	9	14	10	26	6	3	5	3	13	17	7	10	9	11	11	8	10	4	8	13	20	24	10.1
26	14	10	17	12	16	26	15	11	6	6	8	7	4	7	13	4	16	11	1	13	2	7	1	7	24	9.8
27	4	0	22	1	-5	-2	-1	-3	-5	9	0	-5	6	-4	10	11	0	4	-1	-4	-1	-1	-1	4	24	1.6
28	5	11	-5	-3	1	-2	-5	-3	5	-5	2	-5	0	0	3	-2	4	11	2	3	-2	23	16	10	24	2.7
29	10	2	5	-3	-2	-5	-5	-5	2	-1	-4	-5	-4	-5	-3	4	2	2	0	2	21	17	0	-2	24	1.0
30	6	-5	6	2	14	6	-5	-5	-5	-5	-1	8	-1	-5	-1	AV	AV	7	2	AV	AV	AV	AV	AV	17	1.1
31	18	6	9	8	15	17	16	11	-2	-1	8	45	1	21	-5	42	4	11	23	11	2	32	15	-5	24	12.6
NO.	31	31	31	31	31	31	31	30	30	30	30	30	30	29	31	29	29	31	31	30	30	30	30	30		
MAX.	31	40	46	14	40	26	26	25	46	12	33	45	19	35	42	84	21	17	23	13	40	32	19	26		
AVG.	5	5	6	4	5	3	4	0	3	1	3	2	1	2	3	8	3	5	5	3	5	7	4	5		

Note: Negative values will be addressed with development of a detection limit in the annual report.

**Warm Springs Site January 2008** (All values are micrograms per cubic meter at Local temperature and pressure)

Hour Beginning																											
DAY	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	OBS	MEAN	
1	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	0	#DIV/0!	
2	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	0	#DIV/0!	
3	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	0	#DIV/0!	
4	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	0	#DIV/0!	
5	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	BA	1	-5	12	2	-4	3	-5	-5	-5	-2	-4	11	-1.1	
6	-4	-5	-3	0	3	-4	2	-5	-2	2	-5	4	0	-5	5	-4	12	1	11	-2	2	-1	2	2	24	0.3	
7	-5	-2	1	7	0	6	-1	-1	0	-1	-5	2	8	5	4	1	3	-5	11	9	8	-5	19	8	24	2.8	
8	-2	-3	0	4	-4	-5	3	-3	-5	6	-3	9	2	-1	-2	5	3	-1	0	-2	5	1	-3	0	24	0.2	
9	2	0	-5	6	-1	-3	-3	0	-1	-1	20	-5	9	0	-1	-2	7	-5	0	-5	-2	2	4	3	24	0.8	
10	-5	-2	2	7	0	7	-2	12	-1	-1	2	34	32	20	8	-3	0	3	4	-1	-2	-1	-3	-5	24	4.4	
11	4	4	-5	3	-2	2	-3	-5	2	-5	2	1	2	3	3	7	-5	-1	-1	-3	2	3	-3	10	24	0.6	
12	6	-5	-5	-3	20	2	-3	-4	-5	-1	-4	-5	1	-2	1	-3	3	4	1	-3	0	-5	1	3	24	-0.3	
13	-1	5	3	10	1	9	-5	26	0	-5	-4	-1	0	-5	7	2	5	-3	3	6	-3	1	10	-5	24	2.3	
14	2	29	-5	-5	-5	0	-5	-2	-3	-5	-4	16	-5	38	9	57	26	-3	-3	8	17	77	10	1	24	10.2	
15	7	20	12	17	11	2	6	12	-1	-5	-2	3	-4	-5	-2	-5	0	-5	0	-5	6	-5	-5	3	24	2.3	
16	-5	4	-5	7	3	-5	-5	-5	1	2	0	-5	1	-4	0	-1	-2	5	-3	1	20	-5	6	-5	24	0.0	
17	-3	2	9	9	0	2	22	7	-5	-5	11	22	-5	12	10	8	12	14	8	23	7	8	5	15	24	7.8	
18	14	0	-5	9	-5	4	-4	3	2	-3	-5	-5	-4	4	1	3	-5	8	-1	4	3	-5	1	-5	24	0.4	
19	-5	-4	10	8	10	14	13	5	2	-5	1	BA	BA	14	-5	0	-5	0	-3	-5	6	-1	184	214	22	20.4	
20	101	77	41	69	123	115	14	26	56	74	43	7	40	13	16	7	7	9	8	-1	2	11	4	7	24	36.2	
21	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	AO	11	76	9	15	24	23	AO	AO	AO	AO	AO	AO	AO	6	26.3	
22	AO	-5	-5	1	-1	8	7	14	9	2	2	18	6	20	5	8	7	3	7	7	30	17	12	10	23	7.9	
23	8	8	0	10	11	1	10	2	-5	-4	-1	18	14	-4	11	12	26	9	28	15	14	15	12	7	24	9.0	
24	19	10	21	13	12	20	4	35	13	4	26	12	12	16	11	17	29	20	28	26	18	7	17	17	24	17.0	
25	21	34	37	50	50	36	13	1	1	6	36	36	55	-2	3	8	10	-5	4	-5	-3	-5	4	98	24	20.1	
26	155	185	188	103	138	177	52	99	41	30	101	73	5	0	-3	-1	-3	7	7	2	1	7	6	1	24	57.1	
27	-3	57	-1	10	4	9	7	22	78	17	32	-3	5	6	10	-2	8	4	0	3	-1	-5	1	-4	24	10.6	
28	-3	2	4	-5	-5	30	361	423	48	47	42	54	84	64	8	3	-5	1	-2	3	5	-5	-5	-5	24	47.7	
29	-5	-3	-5	-5	-5	3	5	4	-5	2	24	95	84	56	33	31	17	3	2	3	-1	-5	4	-5	24	13.6	
30	-5	6	-5	-5	5	-5	-5	-2	-2	-3	-5	-5	-5	9	-4	2	-5	5	-1	-4	6	-5	-5	1	24	-1.5	
31	10	2	-4	-5	2	-1	4	6	40	-2	4	46	38	55	10	23	8	-5	-3	6	-5	-5	5	-5	24	9.3	
NO.	24	25	25	25	25	25	25	25	25	25	25	25	25	27	27	27	27	26	26	26	26	26	26	26			
MAX.	155	185	188	103	138	177	361	423	78	74	101	95	84	64	33	57	29	20	28	26	30	77	184	214			
AVG.	13	17	11	13	15	17	19	27	10	6	12	17	18	12	5	8	7	2	4	3	5	3	11	14			

Note: Negative values will be addressed with development of a detection limit in the annual report.



**Warm Springs Site February 2008** (All values are micrograms per cubic meter at Local temperature and pressure)

DAY	Hour Beginning																								OBS	MEAN
	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300		
1	-5	1	-4	2	-5	-5	-5	-5	-5	25	33	2	18	9	-5	-2	4	15	-5	9	-5	-1	2	-3	24	2.7
2	-2	-2	-5	-1	5	-5	-5	-3	-5	-5	-5	-5	-2	9	-5	-5	13	2	-4	-5	1	-5	10	-5	24	-1.4
3	-3	-5	3	-3	0	-4	-1	38	2	-5	-5	-4	7	3	8	-2	5	8	-5	3	3	1	-1	-5	24	1.6
4	1	-1	10	15	8	8	-5	2	4	10	-5	5	25	-1	18	7	0	17	-2	-5	19	3	-5	-5	24	5.1
5	-5	-2	-3	-2	-5	-5	-5	0	-4	-5	-3	0	-5	2	7	6	3	10	13	-5	6	0	-5	-4	24	-0.5
6	20	71	4	-1	-3	72	4	-4	-5	-5	11	-3	6	37	21	-5	2	0	-5	-5	1	-5	-5	0	24	8.5
7	0	10	6	0	1	23	5	-3	10	16	30	-4	89	2	4	BA	5	29	18	10	-2	1	-5	-2	23	10.6
8	-5	-4	-5	-5	-5	-5	6	-5	-2	16	-5	-2	4	-5	-5	-5	-5	-2	-5	-5	-5	-1	4	-5	24	-2.3
9	-5	-5	-5	-5	-5	4	-1	-5	-5	-4	-5	0	-5	-4	-5	-4	-2	-5	0	-1	-1	-3	2	-1	24	-2.9
10	3	-4	2	-5	0	-5	0	-5	-3	-5	-5	2	-5	6	0	-5	-5	7	-2	-2	-3	-1	-4	5	24	-1.4
11	3	2	-4	-2	-2	5	-5	1	3	-5	-5	-5	-5	8	-5	0	-5	-1	-2	-5	-3	11	6	3	24	-0.5
12	6	-2	-5	-1	6	-5	-5	8	-5	-5	0	-5	-3	-5	8	-3	4	-1	1	0	2	-5	6	-2	24	-0.5
13	8	0	-2	-4	-4	6	-3	-1	-5	9	-5	-2	2	-5	13	4	12	27	6	6	5	-5	-1	-5	24	2.3
14	7	2	-5	3	-2	2	1	2	-5	-5	0	-3	-5	-5	6	5	1	6	-4	3	-5	-5	3	-2	24	-0.2
15	6	5	-5	-2	10	-5	23	-5	-1	-1	-2	-5	-3	BA	7	1	-5	2	-1	7	8	-5	-4	1	23	1.1
16	-4	0	2	-5	19	6	0	8	-5	-5	-4	-5	-2	2	-5	5	-5	-5	7	-5	7	7	-4	21	24	1.3
17	73	85	7	7	5	-5	-2	0	0	-5	-5	-5	-5	8	9	-5	1	7	-5	-2	5	9	9	13	24	8.3
18	14	15	-5	-3	3	13	-4	1	6	4	3	6	9	1	3	0	-5	4	-2	13	0	5	11	17	24	4.5
19	-5	11	2	-4	8	-3	15	4	-5	8	0	4	9	BA	7	9	15	11	6	19	22	9	13	0	23	6.7
20	3	4	12	5	0	10	-5	22	-5	20	3	-1	13	-1	5	5	7	9	-4	14	11	-5	-3	17	24	5.7
21	14	11	14	11	14	6	23	13	12	0	4	7	7	12	9	19	15	3	8	3	4	24	25	12	24	11.3
22	23	18	13	-1	14	19	24	-5	20	6	5	3	-1	3	-2	11	10	4	1	6	3	9	-1	2	24	7.7
23	24	22	7	21	-1	11	7	2	2	-1	-5	4	11	-2	8	4	9	18	16	8	16	-5	-5	17	24	7.8
24	2	AV	AV	AV	-1	-1	7	12	7	4	5	-1	3	5	-2	-5	6	8	-5	6	7	4	5	6	21	3.4
25	8	21	31	33	26	36	31	31	21	12	15	25	31	29	20	20	32	15	34	23	17	57	21	23	24	25.5
26	36	28	45	-5	38	-5	23	7	15	6	12	7	12	9	11	0	17	9	8	0	6	11	4	1	24	12.3
27	-5	26	17	19	-5	23	3	6	-5	7	-1	-5	-1	4	10	9	15	2	-5	10	-2	0	3	-5	24	5.0
28	2	-5	-2	2	-5	-5	-2	-4	-5	-3	-2	-3	13	-3	3	3	2	6	4	5	-5	-5	-5	14	24	0.0
29	-3	-5	0	3	6	-5	-5	-5	-1	-5	-1	5	4	3	2	6	-5	-5	-5	4	3	-2	11	-5	24	-0.2
NO.	29	28	28	28	29	29	29	29	29	29	29	29	29	27	29	28	29	29	29	29	29	29	29	29	29	
MAX.	73	85	45	33	38	72	31	38	21	25	33	25	89	37	21	20	32	29	34	23	22	57	25	23		
AVG.	7	11	4	3	4	6	4	4	1	3	2	0	8	4	5	3	5	7	2	4	4	3	3	4		

Note: Negative values will be addressed with development of a detection limit in the annual report.

**Warm Springs Site March 2008** (All values are micrograms per cubic meter at Local temperature and pressure)

Hour Beginning																										
DAY	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	OBS	MEAN
1	9	-1	6	1	2	0	3	5	-5	16	-5	-1	-5	-5	6	-2	-4	7	-4	-5	7	-5	-5	-5	24	0.4
2	-5	-5	-2	2	-3	-2	-5	-5	6	-5	-5	3	0	-4	1	7	6	10	-4	-5	-3	10	1	2	24	-0.2
3	-3	0	-3	-5	3	1	8	3	11	1	17	8	5	8	4	18	4	5	2	1	6	4	7	-1	24	4.3
4	1	5	-2	-5	1	-5	2	-5	-5	-4	-5	-5	-3	5	17	75	3	0	8	13	-5	17	3	13	24	5.0
5	2	6	3	0	1	-4	11	0	2	3	0	6	4	21	-5	12	-5	1	7	6	5	4	1	2	24	3.5
6	3	-1	14	-5	-5	-5	3	11	-5	5	-3	4	-4	BA	-2	5	4	0	9	1	1	11	-1	4	23	1.9
7	-4	3	-3	0	6	0	-4	-5	-3	2	-3	3	8	8	4	1	2	-5	3	10	-1	-2	13	0	24	1.4
8	4	-5	0	8	-1	8	3	-5	-5	2	2	6	11	0	-5	2	4	5	-5	14	-1	5	1	5	24	2.2
9	5	2	4	3	8	9	119	8	-3	-3	-5	-1	0	2	0	5	7	2	-3	0	-5	15	5	0	24	7.3
10	1	-2	-5	3	2	4	5	11	-3	1	4	-1	-2	-4	-3	0	2	5	-5	-5	-1	3	2	7	24	0.8
11	3	0	2	-2	4	1	8	16	16	4	11	3	11	4	-5	-5	-5	2	4	-3	4	-4	0	1	24	2.9
12	6	7	1	-3	6	-3	-3	-5	-5	-1	-4	-2	5	-2	9	4	-3	0	4	0	5	5	-5	9	24	1.0
13	1	4	-1	-5	-4	9	-1	9	5	-5	-1	6	-3	0	-2	6	0	4	5	11	5	25	22	15	24	4.4
14	10	28	0	18	12	22	47	29	-5	-5	1	-2	-1	3	-5	-1	0	4	-2	7	-2	-5	-5	1	24	6.2
15	6	-2	4	9	-5	1	-5	2	-1	-2	-5	2	-5	15	-5	5	-5	5	6	3	5	4	2	4	24	1.6
16	8	15	-1	-5	3	4	0	-4	-5	-5	-3	-2	-4	-4	3	-4	2	2	-5	0	-2	-1	-3	2	24	-0.4
17	-5	-4	-4	-5	-4	-4	-2	7	-5	1	-3	-5	7	-2	0	2	-5	4	0	-5	4	4	2	3	24	-0.8
18	-5	-2	40	8	2	6	5	-5	10	-5	10	11	11	6	9	10	20	13	7	13	5	-5	15	5	24	7.7
19	16	8	8	12	9	26	7	-5	3	18	8	15	10	5	11	12	8	15	20	25	-2	21	22	9	24	11.7
20	29	18	44	34	36	15	-5	20	-5	3	9	0	4	7	-1	2	5	6	4	8	3	-5	9	11	24	10.5
21	13	21	-5	-4	12	15	0	-5	2	0	25	6	-5	1	-3	-1	-3	3	8	-5	-1	-5	9	-1	24	3.2
22	-3	4	2	-5	-2	6	-1	-5	-5	-4	2	6	-3	-5	BA	18	6	9	0	15	2	-5	14	8	23	2.3
23	12	6	-3	2	4	0	4	-5	-5	2	72	40	82	53	7	28	5	3	11	5	7	10	0	15	24	14.8
24	9	9	10	12	-3	4	-1	-5	-4	-5	5	0	2	1	8	0	7	6	8	3	13	5	9	9	24	4.3
25	13	9	-2	20	0	14	17	19	1	-3	6	9	1	1	11	11	7	15	9	12	7	5	6	11	24	8.3
26	14	14	16	13	12	14	15	-4	10	9	3	3	3	-5	6	11	13	58	6	4	8	-3	8	-2	24	9.4
27	6	6	65	-5	-3	1	5	-5	0	5	-4	-4	6	6	-5	-5	3	3	-5	0	-5	1	-5	4	24	2.7
28	7	-1	1	-5	3	0	-5	-3	-3	-3	2	-4	-5	5	7	-5	4	14	5	3	-5	27	22	15	24	3.2
29	12	-5	14	-5	-1	-5	-5	-5	2	3	-5	7	-4	-5	1	4	6	2	14	3	1	3	5	-5	24	1.3
30	10	0	3	6	12	11	-5	-5	-5	-5	-2	3	-5	12	5	-5	4	0	9	9	45	22	12	12	24	6.0
31	0	5	-4	10	14	15	10	-5	1	0	5	4	-2	14	13	-5	3	11	7	-5	2	11	8	19	24	5.5
NO.	31	31	31	31	31	31	31	31	31	31	31	31	31	30	30	31	31	31	31	31	31	31	31	31		
MAX.	29	28	65	34	36	26	119	29	16	18	72	40	82	53	17	75	20	58	20	25	45	27	22	19		
AVG.	6	5	7	3	4	5	7	2	0	1	4	4	4	5	3	7	3	7	4	4	3	6	6	6		

Note: Negative values will be addressed with development of a detection limit in the annual report.

### Qualifier Codes and Descriptions

as of 12-APR-07

Qualifier Type	Qualifier Type Desc	Qualifier Code	Qualifier Desc
EX	Exceptional Event Qualifier	D	SANDBLASTING
		F	STRUCTURAL FIRE
		H	CHEMICAL SPILLS & INDUST. ACCIDENTS
		I	UNUSUAL TRAFFIC CONGESTION
		J	CONSTRUCTION/DEMOLITION
		K	AGRICULTURAL TILLING
		L	HIGHWAY CONSTRUCTION
		M	REROUTING OF TRAFFIC
		N	SANDING/SALTING OF STREETS
		O	INFREQUENT LARGE GATHERINGS
		P	ROOFING OPERATIONS
		Q	PRESCRIBED BURNING
		R	CLEAN UP AFTER A MAJOR DISASTER
NAT	Natural Event Qualifier	A	HIGH WINDS
		B	STRATOSPHERIC OZONE INTRUSION
		C	VOLCANIC ERUPTIONS
		E	FOREST FIRE
		G	HIGH POLLEN COUNT
		S	SEISMIC ACTIVITY
		U	SAHARA DUST
NULL	Null Data Qualifier	AA	SAMPLE PRESSURE OUT OF LIMITS
		AB	TECHNICIAN UNAVAILABLE
		AC	CONSTRUCTION/REPAIRS IN AREA
		AD	SHELTER STORM DAMAGE
		AE	SHELTER TEMPERATURE OUTSIDE LIMITS
		AF	SCHEDULED BUT NOT COLLECTED
		AG	SAMPLE TIME OUT OF LIMITS
		AH	SAMPLE FLOW RATE OUT OF LIMITS
		AI	INSUFFICIENT DATA (CANNOT CALCULATE)
		AJ	FILTER DAMAGE
		AK	FILTER LEAK
		AL	VOIDED BY OPERATOR
		AM	MISCELLANEOUS VOID
		AN	MACHINE MALFUNCTION
		AO	BAD WEATHER
		AP	VANDALISM
		AQ	COLLECTION ERROR
		AR	LAB ERROR
		AS	POOR QUALITY ASSURANCE RESULTS
		AT	CALIBRATION
		AU	MONITORING WAIVED
		AV	POWER FAILURE (POWR)
		AW	WILDLIFE DAMAGE
		AX	PRECISION CHECK (PREC)
		AY	Q C CONTROL POINTS (ZERO/SPAN)
		AZ	Q C AUDIT (AUDT)

		BA	MAINTENANCE/ROUTINE REPAIRS
		BB	UNABLE TO REACH SITE
		BC	MULTI-POINT CALIBRATION
		BD	AUTO CALIBRATION
		BE	BUILDING/SITE REPAIR
		BF	PRECISION/ZERO/SPAN
		BG	Missing ozone data not likely to exceed level of standard
		BH	Interference/co-elution
		BI	Lost or damaged in transit
		BJ	Operator Error
		BK	Site computer/data logger down
		SA	Storm Approaching
QA	Quality Assurance Qualifier	1	Deviation from a CFR/Critical Criteria Requirement
		2	Operational Deviation
		3	Field Issue
		4	Lab Issue
		5	Outlier
		6	QAPP Issue
		7	Below Lowest Calibration Level
		9	Negative value detected - zero reported
		MD	Value between MDL and IDL
		ND	No Value Detected
		SQ	Values Between SQL and MDL
		V	VALIDATED VALUE
		W	FLOW RATE AVERAGE OUT OF SPEC.
		X	FILTER TEMPERATURE DIFFERENCE OUT OF SPEC.
		Y	ELAPSED SAMPLE TIME OUT OF SPEC.